Nokia Customer Care

Service Manual

RM-42 (Nokia N90)
Mobile Terminal
Part No: 9241872 (Issue 2)

COMPANY CONFIDENTIAL

NOKIA

Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
Issue 1	06/2005	J-PH	
Issue 2	02/2006	J-PH	Baseband troubleshooting and Service concepts updated

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IMPORTANT

This document is intended for use by qualified service personnel only.

Warnings and cautions

Warnings

- IF THE DEVICE CAN BE INSTALLED IN A VEHICLE, CARE MUST BE TAKEN ON INSTALLATION IN VEHICLES FITTED WITH ELECTRONIC ENGINE MANAGEMENT SYSTEMS AND ANTI-SKID BRAKING SYSTEMS. UNDER CERTAIN FAULT CONDITIONS, EMITTED RF ENERGY CAN AFFECT THEIR OPERATION. IF NECESSARY, CONSULT THE VEHICLE DEALER/ MANUFACTURER TO DETERMINE THE IMMUNITY OF VEHICLE ELECTRONIC SYSTEMS TO RF ENERGY.
- THE PRODUCT MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES, FOR EXAMPLE, PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.
- OPERATION OF ANY RADIO TRANSMITTING EQUIPMENT, INCLUDING CELLULAR TELEPHONES, MAY INTERFERE WITH THE FUNCTIONALITY OF INADEQUATELY PROTECTED MEDICAL DEVICES. CONSULT A PHYSICIAN OR THE MANUFACTURER OF THE MEDICAL DEVICE IF YOU HAVE ANY QUESTIONS. OTHER ELECTRONIC EQUIPMENT MAY ALSO BE SUBJECT TO INTERFERENCE.
- BEFORE MAKING ANY TEST CONNECTIONS, MAKE SURE YOU HAVE SWITCHED OFF ALL EQUIPMENT.

Cautions

- Servicing and alignment must be undertaken by qualified personnel only.
- Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
- Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.
- Use only approved components as specified in the parts list.
- Ensure all components, modules, screws and insulators are correctly re-fitted after servicing and alignment.
- Ensure all cables and wires are repositioned correctly.
- Never test a mobile phone WCDMA transmitter with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.
- During testing never activate the GSM or WCDMA transmitter without a proper antenna load, otherwise GSM or WCDMA PA may be damaged.

ESD protection

Nokia requires that service points have sufficient ESD protection (against static electricity) when servicing the phone.

Any product of which the covers are removed must be handled with ESD protection. The SIM card can be replaced without ESD protection if the product is otherwise ready for use.

To replace the covers ESD protection must be applied.

All electronic parts of the product are susceptible to ESD. Resistors, too, can be damaged by static electricity discharge.

All ESD sensitive parts must be packed in metallized protective bags during shipping and handling outside any ESD Protected Area (EPA).

Every repair action involving opening the product or handling the product components must be done under ESD protection.

ESD protected spare part packages MUST NOT be opened/closed out of an ESD Protected Area.

For more information and local requirements about ESD protection and ESD Protected Area, contact your local Nokia After Market Services representative.

Care and maintenance

This product is of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfil any warranty obligations and to enjoy this product for many years.

- Keep the phone and all its parts and accessories out of the reach of small children.
- Keep the phone dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the phone in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the phone in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store the phone in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.
- Do not drop, knock or shake the phone. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the phone.
- Do not paint the phone. Paint can clog the moving parts and prevent proper operation.
- Use only the supplied or an approved replacement antenna. Unauthorised antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

All of the above suggestions apply equally to the product, battery, charger or any accessory.

Company Policy

Our policy is of continuous development; details of all technical modifications will be included with service bulletins.

While every endeavour has been made to ensure the accuracy of this document, some errors may exist. If any errors are found by the reader, NOKIA MOBILE PHONES Business Group should be notified in writing/e-mail.

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Battery information

Note: A new battery's full performance is achieved only after two or three complete charge and discharge cycles!

The battery can be charged and discharged hundreds of times but it will eventually wear out. When the operating time (talk-time and standby time) is noticeably shorter than normal, it is time to buy a new battery.

Use only batteries approved by the phone manufacturer and recharge the battery only with the chargers approved by the manufacturer. Unplug the charger when not in use. Do not leave the battery connected to a charger for longer than a week, since overcharging may shorten its lifetime. If left unused a fully charged battery will discharge itself over time.

Temperature extremes can affect the ability of your battery to charge.

For good operation times with Ni-Cd/NiMh batteries, discharge the battery from time to time by leaving the product switched on until it turns itself off (or by using the battery discharge facility of any approved accessory available for the product). Do not attempt to discharge the battery by any other means.

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

Do not short-circuit the battery. Accidental short-circuiting can occur when a metallic object (coin, clip or pen) causes direct connection of the + and - terminals of the battery (metal strips on the battery) for example when you carry a spare battery in your pocket or purse. Short-circuiting the terminals may damage the battery or the connecting object.

Leaving the battery in hot or cold places, such as in a closed car in summer or winter conditions, will reduce the capacity and lifetime of the battery. Always try to keep the battery between 15°C and 25°C (59°F and 77° F). A phone with a hot or cold battery may temporarily not work, even when the battery is fully charged. Batteries' performance is particularly limited in temperatures well below freezing.

Do not dispose of batteries in a fire!

Dispose of batteries according to local regulations (e.g. recycling). Do not dispose as household waste.

Nokia N90 Service Manual Structure

1 General Information
2 Parts Lists and Component Layouts
3 Service Software Instructions
4 Service Tools and Service Concepts
5 Disassembly / Reassembly Instructions
6 BB Troubleshooting and Manual Tuning Guide
7 RF Troubleshooting and Manual Tuning Guide
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1 — General Information

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RM-42 product selection

The Nokia RM-42 is a GSM/WCDMA Dual mode hand portable phone supporting EGSM 900/1800/1900 and WCDMA 2100 (UMTS).

The Nokia RM-42 is a 3GPP Release 99 terminal supporting WCDMA, EGPRS and GPRS data bearers. For WCDMA the maximum bit rate is up to 384 kbps for downlink and 128 kbps for uplink with simultaneous CS speech (12.2 kbps). For GSM networks the Nokia RM-42 is a class B terminal with EGPRS multislot class 10 (4 Rx + 1 Tx, 3+2) and GPRS multislot class 10 (4+1, 3+2)

According to GSM standard 05.05 it responds to class 4 (max. 2W) in EGSM 900, class 1 (1W) in DCS 1800 and class 1 in PCS 1900. The Nokia RM-42 supports EGPRS (EDGE) class B as well as Bluetooth 1.1 standard.

The handset has full phase 2 Type Approval and complies with GSM Type Approval. It has full CE approval and FCC approval.

Nokia RM-42 is supporting two way video calls with one integrated swing axis camera. Nokia RM-42 is an MMS (Multimedia Messaging Service) enabled phone with a large bright high-resolution color display and an integrated 2.0 Mega Pixel (effective image size 1.92 Megapixel) digital camera. The MMS implementation follows the OMA MMS standard release 1.2. The WAP 2.0 compatible Browser supports XHTML Mobile Profile (MP) and uses a TCP/IP stack to communicate with a gateway in network.

Nokia RM-42 uses Symbian 8.1a operating system and supports also MIDP Java 2.0 & CLDC1.1, providing a good platform for compelling 3rd party applications.

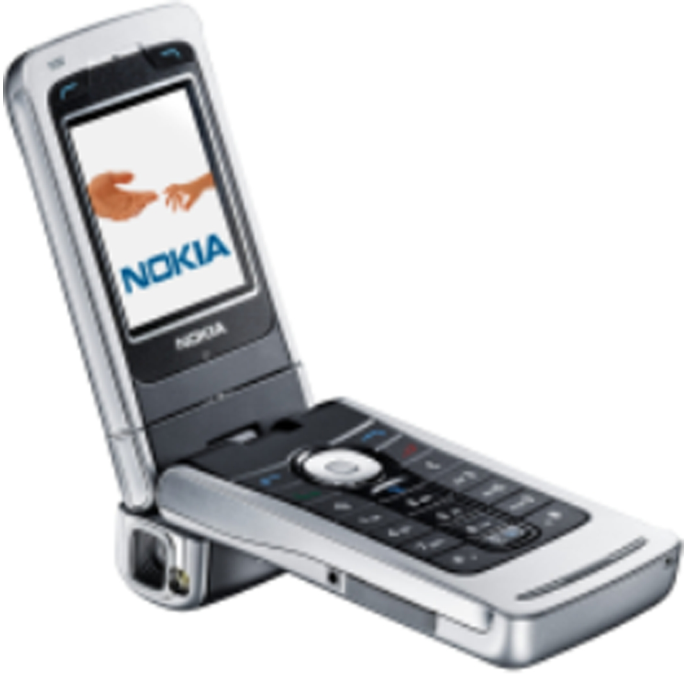

Figure 1 View of RM-42

RM-42 transceiver features

Displays

Main display:

- · A high resolution, full graphics, TFT (Thin Film Transistor) Active Matrix colour display (262144 colors, 18-bit)
- · Display resolution is 352 x 416 pixels
- · 416 x 352 in landscape view

- · Active area dimensions are 34.85 mm x 41.18 mm (Approx 2.12" Diagonal)

Cover display:

- · A full graphics, TFT (Thin Film Transistor) Active Matrix colour display (65536 colors, 16-bit)
- · Display resolution is 128 x 128 pixels
- · Active area dimensions are 27.69 x 27.69 mm

Both displays are of transflective active matrix type. This means display works as a reflective display (backlight off) in bright light conditions and as a transmissive display (backlight on) in low light conditions.

Camera

Nokia RM-42 has one integrated swing axis digital camera supporting still image and video capture. Same camera is also used for video calls.

Nokia RM-42 camera characteristics are following:

Sensor type:	CMOS
Sensor Photo detectors:	2.0 million
F number/Aperture:	F2.88
Focal length:	f5.5mm (35mm film format equivalent f35mm)
Focus range:	10cm (macro mode) to infinity
Still image resolutions:	1600x1200, 800x600, 640x480
Still image file format:	EXIF (JPEG), *.jpg
Still image compression:	• Low: Q value 50 (typically 80-150kB image file) • Basic: Q value 50 (typically 80-150kB image file) • Normal: Q value 82 (default setting, 200-250kB) • Fine: Q value 94 (approximately 300-700+ kB)
Video resolutions:	352x288 (CIF), 176x144, 128x96. All 15 frames per second.
Video clip length:	30 seconds or free. Maximum clip length in free mode is one hour.
Video file formats:	MPEG-4, .mp4 and 3GPP, *.3gp (mp4: 768kbpss, 3gp: 64kbps in short mode and 128kbps in maximum mode)
Exposure:	Automatic and manual
White balance:	Automatic or adjustable
ISO:	250 - 2000 (Automatic)
Colours:	16.7 million / 24-bit
Capture modes:	Night mode, sequence mode, selftimer

Hardware characteristics

- · Dual mode WCDMA/GSM and triband GSM 900/1800/1900 (WCDMA 2100)

- · Codecs: Decoding: MP3, AAC, Real Audio, WAV, Nokia Ring Tones, AMR, AMR-WB, AMR-NB, AU, MIDI, H.263, JPEG, JPEG2000, EXIF 2.2, GIF 87/89, PNG, BMP (W-BMP), MBM, MPEG-4 Encoding: AMR, AMR-NB, AAC, H.263, JPEG, EXIF 2.2, MPEG-4
- · Main display: 2.1” (34x41mm) up to 262,144 colours TFT Active matrix display, 352x416 pixels
- · Cover display:27.7x27.7mm up to 65,536 colours TFT Active matrix display,128x128pixels
- · Keymat: ITU-T keymat, plastic keys and metal domes
- · Antenna: Internal
- · Ringing vol.: 105 dB from 5cm distance
- · Charging: 2mm jack, or via Pop-Port
- · Headset: Pop-Port connector/Bluetooth connectivity
- · Memory: 35MB internal memory and 64 MB Reduced Size Dual Voltage MultiMediaCard (RS-MMC) in the standard sales package
- · Camera: 2Mpixel (effective resolution 1.92 Mpixel, 1600x1200 pixels)
- · Flash: LED flash integrated to camera unit

UI features

- · High resolution display 352x416 pixels, up to 262,144 colours
- · Landscape oriented user interface for camcorder mode
- · Cover display in Nokia Series 60 phone 128x128 pixels up to 65536 colours
- · Fold and twist form factor combined with rotating camera unit (four axis concept)
- · 2Mpix (effective resolution 1.92Mpixel) autofocus camera
- · MP4 for video recording and playback (MPEG4 & AAC-LC)
- Speaker Independent Name Dialling (SIND)

Sales package

- · Customer Tranceiver
- · Wrist trap
- · Cleaning towel
- · Charger AC-4
- · Charger adapter CA-44 2.5/2mm
- · Battery BL-5B
- · 1-2 Booklets
  - · Users guide(s) 1 languages per package
  - · Club Nokia
  - · Warranty disclaimer
  - · Enhancements
- · Add-on Applications Guide(MMC and CD-ROM)
  - · MMC application and warranty disclaimer
- · Quick Start Guide
- · Sample Image Print
- · MMC Carrying Case
  - · 64MB RS-MMC Memory Card MU-1

  - · Adapter to full size MMC
  - · Label
- · CD-ROM
  - · PC Suite, applications, etc.
- · Stereo headset HDS-3
- · Data cable CA-53 (or DKU-2)
- · Sales box + 3 inner parts

RM-42 mobile enhancements

Table 1 Batteries

Battery	Type	Product code
Battery	BL-5B	

Table 2 Chargers

Chargers	Type	Product code
Fast travel charger (multi-voltage), Australia	ACP-12A	
Fast travel charger (multi-voltage), Argentina	ACP-12AR	
Fast travel charger (multi-voltage), China	ACP-12C	
Fast travel charger (Euro plug), 100- 240 Vac	ACP-12E	
Fast travel charger (US plug), 100-240 Vac	ACP-12US	
Travel charger (multi-voltage), Brazil/Portugal	ACP-12UB	
Fast travel charger, Japan	ACP-12J	
Fast travel charger (gradiente CR1000), Brazil	ACP-12G	
Fast travel charger (UK plug), multi-voltage	ACP-12X	
Retractable travel charger (Europe)	AC-1E	
Retractable travel charger (UK)	AC-1X	
Charging adapter	CA-44	

Table 3 Car accessories

Car accessories	Type	Product code
Headres handsfree	BHF-3	

Car accessories	Type	Product code
Plug-in car handsfree	HF-3	
Wireless plug-in car handsfree	HF-6W	
Wireless car kit	CK-1W	
Advanced car kit	CK-7W	
Mobile charger (LCH-12 update)	DC-4	

Table 4 Pop-Port™ accessories

Pop Port ™ accessories	Type	Product code
Boom mono headset	HDB-4	
Fashion stereo headset	HDS-3	
Mono headset	HS-5	
Stereo headset	HS-3	
Retractable headset	HS-10	
USB data cable	DKU-2	
Loopset	LPS-4	
FM radio headset	HS-2R	

Table 5 Imaging accessories

Imaging accessories	Type	Product code
Nokia remote camera	PT-6	
Image album	PD-1	

Table 6 Bluetooth accessories

Bluetooth accessories	Type	Product code
Wireless headset	HDW-3	
Wireless clip-on headset	HS-21W	
Wireless boom headset	HS-4W	
Wireless headset	HS-11W	
Wireless image headset	HS-13W	
Wireless plug-in car handsfree	HF-6W	
Wireless car kit	CK-1W	
Advanced car kit	CK-7W	
Wireless GPS module	LD-1W	
Wireless keyboard	SU-8W	

Table 7 Other accessories

Other accessories	Type	Product code
64MB MultiMediaCard	MU-1	
128MB MultiMediaCard	MU-2	
256MB MultiMediaCard	MU-9	
512MB MultiMediaCard	MU-12	
Connectivity cable	DKU-2	
Connectivity cable	CA-53	

Technical specifications

RM-42 transceiver general specifications

Unit	Dimensions (L x W x T)	Weight (g)	Volume (cm3)
Transceiver without BL-5B 760mAh Li-ion battery back	112 x 51 x 24	173	126cc

Main RF characteristics for triple-band (EGSM900/GSM1800/GSM1900) and WCDMA phones

Parameter	Unit
Cellular system	EGSM900, GSM1800/1900 and WCDMA
Rx frequency band	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
	WCDMA: 2110 - 2170 MHz
Tx frequency band	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
	WCDMA: 1920 - 1980 MHz
Output power	GSM900: +5 ... +33dBm/3.2mW ... 2W
	GSM1800: +0 ... +30dBm/1.0mW ... 1W
	GSM1900: +0 ... +30dBm/1.0mW ... 1W
	WCDMA -50 ... 21 dBm
Number of RF channels	GSM900: 125
	GSM1800: 375
	GSM1900: 300
Channel spacing	200 kHz

Parameter	Unit
Number of Tx power levels	GSM900: 15
	GSM1800: 16
	GSM1900: 16

Battery endurance

Battery	Capacity (mAh)	Talk time	Stand-by
BL-5B	760	up to 3 hrs	up to 12 days

Charging times

ACP-12	LCH-12
1 h	1 h

Environmental conditions

Environmental condition	Ambient temperature	Notes
Normal operation	-10ºC...+55ºC	Specifications fulfilled
No operation or storage	<-40ºC...>+85ºC	No storage or operation: an attempt may damage the phone.
Charging allowed	-25ºC...+50ºC	
Long term storage conditions	0ºC...+85ºC	

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2 — Parts Lists and Component Layouts

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Exploded view

RM-42 exploded view

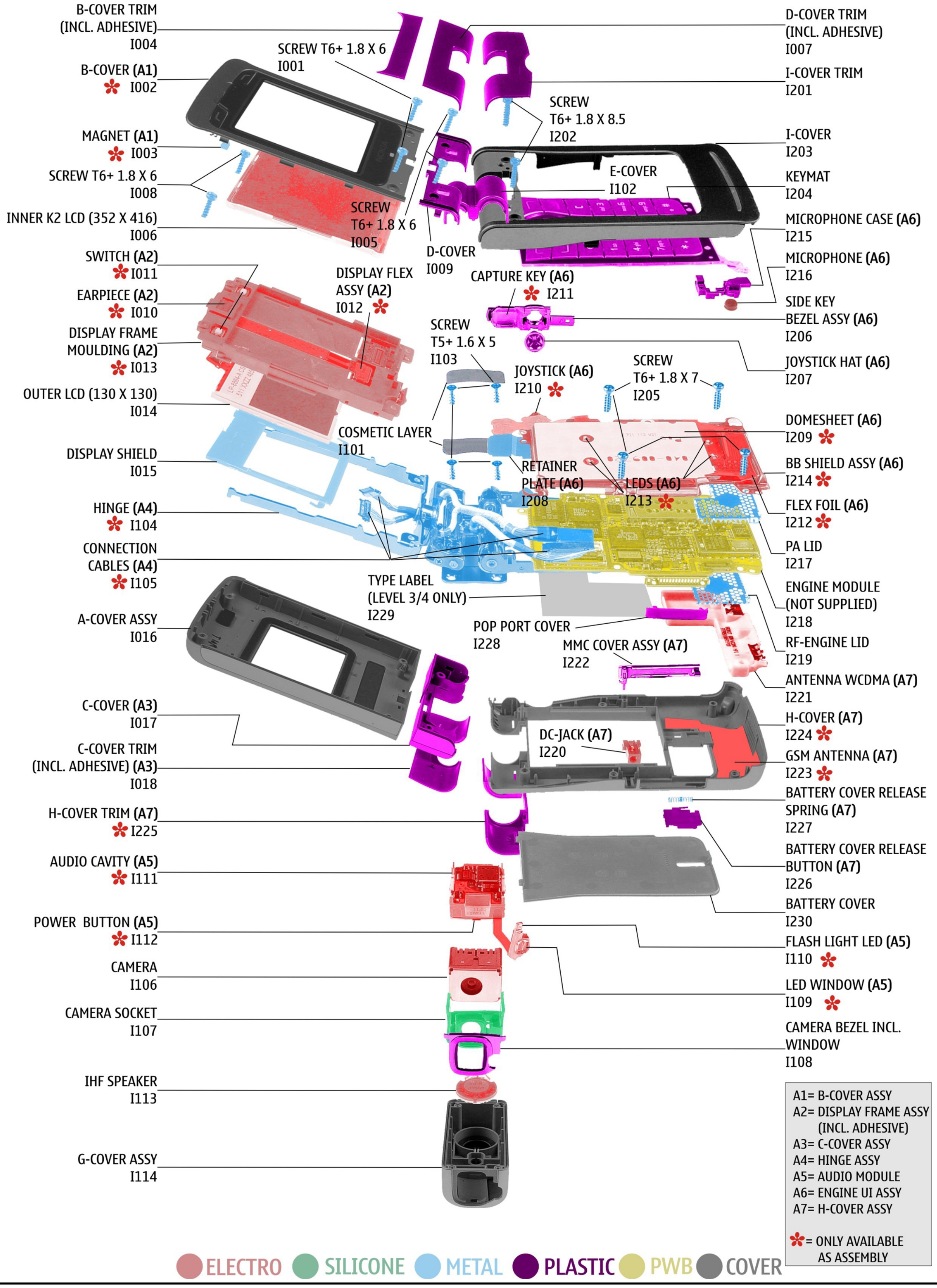
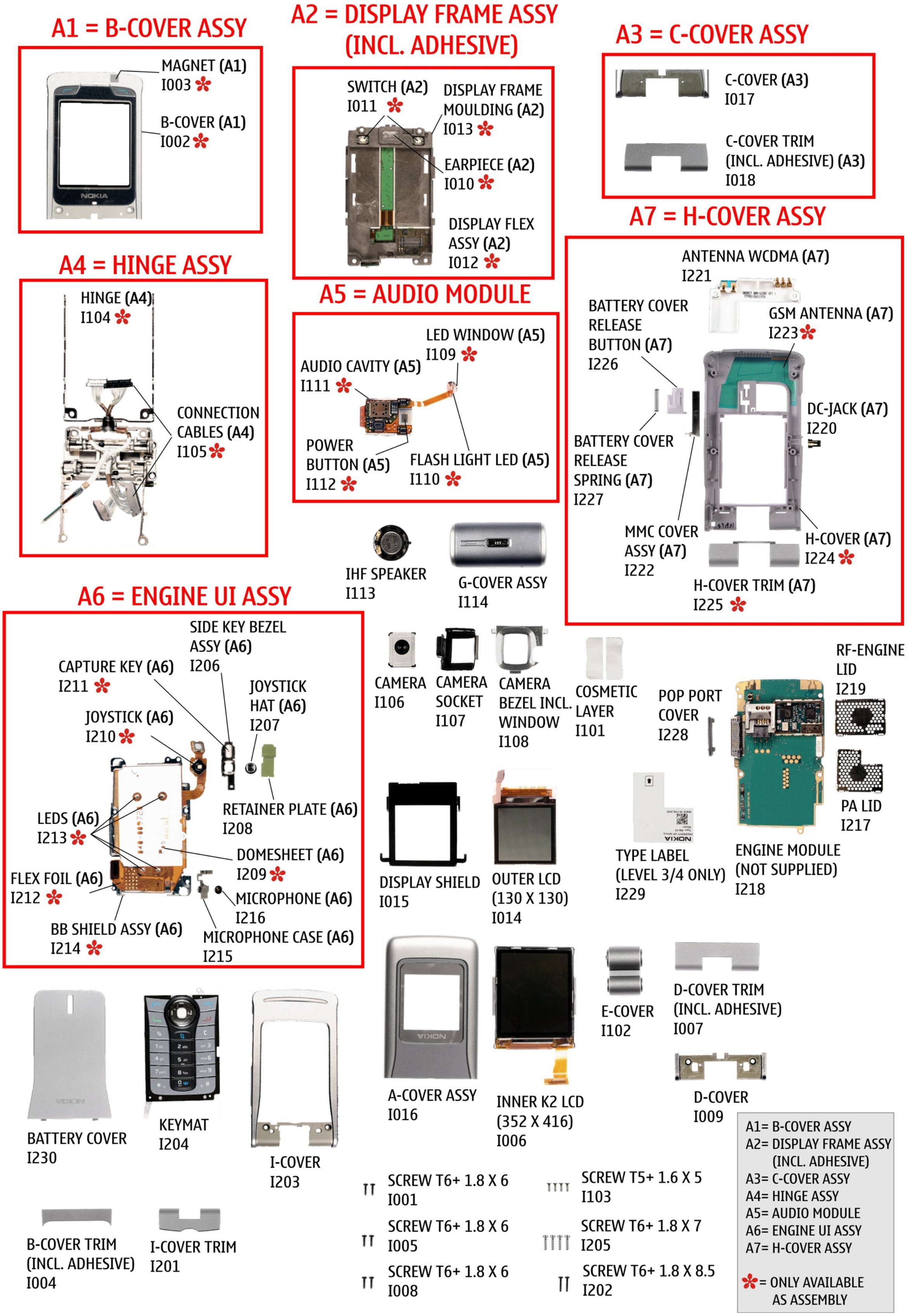

B-COVER TRIM (INCL. ADHESIVE) I004
B-COVER (A1) ✻ I002
MAGNET (A1) ✻ I003
SCREW T6+ 1.8 X 6 I008
INNER K2 LCD (352 X 416) I006
SWITCH (A2) ✻ I011
EARPIECE (A2) ✻ I010
DISPLAY FRAME MOULDING (A2) ✻ I013
OUTER LCD (130 X 130) I014
DISPLAY SHIELD I015
HINGE (A4) ✻ I104
CONNECTION CABLES (A4) ✻ I105
A-COVER ASSY I016
C-COVER (A3) I017
C-COVER TRIM (INCL. ADHESIVE) (A3) I018
H-COVER TRIM (A7) ✻ I225
AUDIO CAVITY (A5) ✻ I111
POWER BUTTON (A5) ✻ I112
CAMERA I106
CAMERA SOCKET I107
IHF SPEAKER I113
G-COVER ASSY I114
SCREW T6+ 1.8 X 6 I001
SCREW T6+ 1.8 X 6 I005
D-COVER I009
DISPLAY FLEX ASSY (A2) I012 ✻
SCREW T5+ 1.6 X 5 I103
COSMETIC LAYER I101
TYPE LABEL (LEVEL 3/4 ONLY) I229
POP PORT COVER I228
MMC COVER ASSY (A7) I222
DC-JACK (A7) I220
SCREW T6+ 1.8 X 8.5 I202
E-COVER I102
CAPTURE KEY (A6) ✻ I211
JOYSTICK (A6) I210 ✻
SCREW T6+ 1.8 X 7 I205
RETAINER PLATE (A6) I208
LEDS (A6) I213 ✻
D-COVER TRIM (INCL. ADHESIVE) I007
I-COVER TRIM I201
I-COVER I203
KEYMAT I204
MICROPHONE CASE (A6) I215
MICROPHONE (A6) I216
SIDE KEY
BEZEL ASSY (A6) I206
JOYSTICK HAT (A6) I207
DOMESHEET (A6) I209 ✻
BB SHIELD ASSY (A6) I214 ✻
FLEX FOIL (A6) I212 ✻
PA LID I217
ENGINE MODULE (NOT SUPPLIED) I218
RF-ENGINE LID I219
ANTENNA WCDMA (A7) I221
H-COVER (A7) I224 ✻
GSM ANTENNA (A7) I223 ✻
BATTERY COVER RELEASE SPRING (A7) I227
BATTERY COVER RELEASE BUTTON (A7) I226
BATTERY COVER I230
FLASH LIGHT LED (A5) I110 ✻
LED WINDOW (A5) I109 ✻
CAMERA BEZEL INCL. WINDOW I108
A1= B-COVER ASSY
A2= DISPLAY FRAME ASSY (INCL. ADHESIVE)
A3= C-COVER ASSY
A4= HINGE ASSY
A5= AUDIO MODULE
A6= ENGINE UI ASSY
A7= H-COVER ASSY
✻= ONLY AVAILABLE AS ASSEMBLY
● ELECTRO ● SILICONE ● METAL ● PLASTIC ● PWB ● COVER

Figure 2 RM-42 exploded view

Parts lists

Mechanical spare parts overview


A1 = B-COVER ASSY
MAGNET (A1) I003 ✻
B-COVER (A1) I002 ✻
A2 = DISPLAY FRAME ASSY (INCL. ADHESIVE)
SWITCH (A2) I011 ✻
DISPLAY FRAME MOULDING (A2) I013 ✻
EARPIECE (A2) I010 ✻
DISPLAY FLEX ASSY (A2) I012 ✻
A3 = C-COVER ASSY
C-COVER (A3) I017
C-COVER TRIM (INCL. ADHESIVE) (A3) I018
A4 = HINGE ASSY
HINGE (A4) I104 ✻
CONNECTION CABLES (A4) I105 ✻
A5 = AUDIO MODULE
LED WINDOW (A5) I109 ✻
AUDIO CAVITY (A5) I111 ✻
POWER BUTTON (A5) I112 ✻
FLASH LIGHT LED (A5) I110 ✻
A7 = H-COVER ASSY
ANTENNA WCDMA (A7) I221
BATTERY COVER RELEASE BUTTON (A7) I226
GSM ANTENNA (A7) I223 ✻
DC-JACK (A7) I220
BATTERY COVER RELEASE SPRING (A7) I227
MMC COVER ASSY (A7) I222
H-COVER (A7) I224 ✻
H-COVER TRIM (A7) I225 ✻
IHF SPEAKER I113
G-COVER ASSY I114
A6 = ENGINE UI ASSY
SIDE KEY BEZEL ASSY (A6) I206
CAPTURE KEY (A6) I211 ✻
JOYSTICK HAT (A6) I207
JOYSTICK (A6) I210 ✻
LEDS (A6) I213 ✻
RETAINER PLATE (A6) I208
DOMESHEET (A6) I209 ✻
FLEX FOIL (A6) I212 ✻
MICROPHONE (A6) I216
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D-COVER I009
BATTERY COVER I230
KEYMAT I204
I-COVER I203
B-COVER TRIM (INCL. ADHESIVE) I004
I-COVER TRIM I201
SCREW T6+ 1.8 X 6 I001
SCREW T6+ 1.8 X 6 I005
SCREW T6+ 1.8 X 6 I008
SCREW T5+ 1.6 X 5 I103
SCREW T6+ 1.8 X 7 I205
SCREW T6+ 1.8 X 8.5 I202

A1= B-COVER ASSY
A2= DISPLAY FRAME ASSY (INCL. ADHESIVE)
A3= C-COVER ASSY
A4= HINGE ASSY
A5= AUDIO MODULE
A6= ENGINE UI ASSY
A7= H-COVER ASSY
✻= ONLY AVAILABLE AS ASSEMBLY

Mechanical spare parts list

Bold=ASSY

"XXXXXXX" = VARIANTS

"-" = NOT AVAILABLE

"???????" = AVAILABLE AS SPARE PART

I0xx = ITEM codes for upper or mono block

I1xx = ITEM codes for hinge block

I2xx = ITEM codes for lower block

I3xx = ITEM codes for soldered spare parts on the upper, hinge or lower block and not exchangable

ITEM	QTY	PART NO	PART NAME
I001	2	????????	SCREW T6+ 1.8X6
		XXXXXXX	**B-COVER ASSY**
I002	1	XXXXXXX	B-COVER
I003	1	???????	MAGNET
I004	1	???????	B-COVER TRIM (INCL. ADHESIVE
I005	2	???????	SCREW T6+ 1.8X6
I006	1	???????	INNER K2 LCD (352X416)
I007	1	XXXXXXX	D-COVER TRIM (INCL. ADHESIVE)
I008	2	???????	SCREW T6+ 1.8X6
i009	1	???????	D-COVER
		???????	**DISPLAY FRAME ASSY**
I010	1	-	EARPIECE
I011	2	-	SWITCH
I012	1	-	DISPLAY FLEX ASSY
I013	1	-	DISPLAY FRAME MOULDING
I014	1	???????	OUTER LCD (130X130)
I015	1	???????	DISPLAY SHIELD
I016	1	XXXXXXX	A-COVER ASSY
		XXXXXXX	**C-COVER ASSY**
I017	1	???????	C-COVER
I018	1	XXXXXXX	C-COVER TRIM (INCL. ADHESIVE)

ITEM	QTY	PART NO	PART NAME
I101	2	???????	COSMETIC LAYER
I102	1	XXXXXXX	E-COVER
I103	4	???????	SCREW T5+ 1.6X5
		???????	**HINGE ASSY**
I104	1	-	HINGE
I105	1	-	CONNECTION CABLES
I106	1	???????	CAMERA
I107	1	???????	CAMERA SOCKET
I108	1	???????	CAMERA BEZEL INCL. WINDOW
		???????	**AUDIO MODULE**
I109	1	-	LED WINDOW
I110	1	-	FLASH LIGHT LED
I111	1	-	AUDIO CAVITY
I112	1	-	POWER BUTTON
I113	1	???????	IHF SPEAKER
I114	1	XXXXXXX	G-COVER ASSY
I201	1	???????	I-COVER TRIM
I202	2	???????	SCREW T6+ 1.8X8.5
I203	1	XXXXXXX	I-COVER
I204	1	XXXXXXX	KEYMAT
I205	4	???????	SCREW T6+ 1.8X7
		???????	**ENGINE UI ASSY**
I206	1	???????	SIDE KEY BEZEL ASSY
I207	1	???????	JOYSTICK HAT
I208	1	???????	RETAINER PLATE
I209	1	-	DOMESHEET
I210	1	-	JOYSTICK
I211	1	-	CAPTURE KEY
I212	1	-	FLEX FOIL
I213	4	-	LEDS
I214	1	-	BB SHIELD ASSY
I215	1	???????	MICROPHONE CASE

ITEM	QTY	PART NO	PART NAME
I216	1	???????	MICROPHONE
I217	1	???????	PA LID
I218	1	???????	ENGINE MODULE
I219	1	???????	RF-ENGINE LID
		XXXXXXX	**H-COVER ASSY**
I220	1	???????	DC JACK
I221	1	???????	ANTENNA WCDMA
I222	1	???????	MMC COVER ASSY
I223	1	-	GSM ANTENNA
I224	1	-	H-COVER
I225	1	-	H-COVER TRIM
I226	1	???????	BATTERY COVER RELEASE BUTTON
I227	1	???????	BATTERY COVER RELEASE SPRING
I228	1	???????	POP-PORT COVER
I229	1	???????	TYPE LABEL
I230	1	XXXXXXX	BATTERY COVER

Component parts lists

Table 8 Component parts list

Item	Side	Grid ref.		Description and Value			
A7400	Bottom	M	7	SHIELD_040_003698	RF-ENGINE SHIELD ASSY R1107		
A7401	Top	N	5	SHIELD_040_003699	PA-SHIELD ASSY R1107		
I216	Top	P	9	MIC_OBE_415S42_RC3310CL	CLAPTON EMC MICROPHONE MOD -42DB		
B2200	Top	K	5	CRYSTAL_3.3X1.6NR	CRYSTAL 32.768KHZ +-20PPM 12.5PF	32.768kHz	

Item	Side	Grid ref.		Description and Value			
C1470	Top	I	1	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C1471	Top	I	2	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C1472	Top	I	1	0805C	CHIPCAP X5R 10U M 6V3 0805	10U	6V3
C1473	Top	D	6	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C1474	Bottom	C	1	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C1475	Top	D	4	0402C	Chipcap 5% X7R	3n3	50V
C1476	Top	D	4	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C1477	Top	C	5	0402C	Chipcap X5R 10% 6.3V 0402	220n	6.3V
C1478	Top	C	6	0402C	CERCAP X7R 22N K 16V 0402	22n	16V
C1479	Top	J	1	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C1480	Top	K	1	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C1481	Top	K	1	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C1482	Top	D	4	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C1483	Top	D	6	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C1484	Top	B	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V

Item	Side	Grid ref.		Description and Value			
C1485	Top	B	2	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C1486	Top	C	4	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C1487	Bottom	C	2	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C1488	Bottom	C	1	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C1489	Top	G	2	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C1490	Top	G	2	0402C	CHIPCAP NP0 270P J 25V 0402	270p	25V
C2000	Bottom	D	1	0402C	Chipcap 5% NP0	27p	50V
C2001	Bottom	D	1	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2002	Top	K	2	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2003	Top	K	2	0402C	CERCAP X7R 22N K 16V 0402	22n	16V
C2004	Top	K	2	0402C	CERCAP X7R 22N K 16V 0402	22n	16V
C2005	Top	J	2	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2006	Top	J	2	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2007	Bottom	L	2	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2008	Bottom	L	2	0402C	Chipcap X7R 10% 16V 0402	10n	16V

Item	Side	Grid ref.		Description and Value			
C2009	Bottom	K	2	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2010	Bottom	K	2	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2011	Top	H	2	0402C	CHIPCAP NP0 270P J 25V 0402	270p	25V
C2070	Bottom	L	3	0402C	Chipcap 5% NP0	15p	50V
C2100	Top	L	5	0402C	CERCAP X7R 22N K 16V 0402	22n	16V
C2101	Top	L	5	0402C	CERCAP X7R 22N K 16V 0402	22n	16V
C2102	Top	L	6	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C2200	Top	L	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2201	Top	J	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2202	Top	L	5	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2203	Top	K	5	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2204	Top	L	4	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2205	Top	L	5	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2206	Top	L	5	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2207	Top	J	4	0402C	Chipcap X7R 10% 50V 0402	1n0	50V

Item	Side	Grid ref.		Description and Value			
C2208	Top	K	5	0402C	Chipcap 5% NP0	27p	50V
C2209	Top	K	5	0402C	Chipcap 5% NP0	22p	50V
C2210	Top	J	3	0603C	CHIPCAP X5R 1U K 16V 0603	1u0	16V
C2211	Top	J	3	0805C	CHIPCAP X5R 4U7 K 10V 0805	4u7	10V
C2212	Top	K	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2213	Top	I	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2214	Top	L	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2215	Top	I	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2216	Top	J	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2217	Top	I	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2219	Top	J	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2220	Top	K	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2221	Top	K	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2222	Top	K	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2223	Top	L	4	0402C	Chipcap X7R 10% 16V 0402	10n	16V

Item	Side	Grid ref.		Description and Value			
C2224	Top	L	5	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2225	Top	K	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2226	Top	J	2	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2227	Top	J	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2228	Top	J	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2230	Top	J	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2231	Top	L	3	0805C	CHIPCAP X5R 10U M 6V3 0805	10U	6V3
C2232	Top	J	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2233	Bottom	M	2	0402C	Chipcap 5% NP0	27p	50V
C2234	Top	J	5	0402C	Chipcap 5% NP0	27p	50V
C2235	Top	L	4	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2300	Top	J	6	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2301	Top	J	6	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2302	Top	L	6	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2303	Top	I	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V

Item	Side	Grid ref.		Description and Value			
C2304	Top	J	5	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2306	Top	I	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2307	Top	I	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2309	Top	I	6	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2312	Top	I	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2313	Top	I	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2314	Top	L	6	0805C	CHIPCAP X5R 4U7 K 25V 0805	4u7	25V
C2315	Top	M	5	0805C	CHIPCAP X5R 4U7 K 25V 0805	4u7	25V
C2700	Bottom	M	4	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2800	Top	I	3	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2801	Top	H	6	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2802	Top	H	6	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2803	Top	I	3	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V

Item	Side	Grid ref.		Description and Value			
C2804	Top	I	3	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2805	Top	I	3	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2806	Top	G	6	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2807	Top	H	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2808	Top	H	6	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2809	Top	H	6	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2810	Top	I	3	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2811	Top	G	3	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2812	Top	I	3	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2813	Top	I	2	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2814	Top	I	4	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2815	Top	I	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V

Item	Side	Grid ref.		Description and Value			
C2816	Top	H	6	0402C	Chipcap 5% NP0	47p	50V
C3000	Top	F	5	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3001	Top	F	5	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3002	Top	F	5	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3003	Top	F	5	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C3004	Top	G	2	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3005	Top	H	2	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3006	Top	H	2	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3007	Top	I	2	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C3008	Top	I	2	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4200	Top	E	9	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C4201	Top	F	9	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C4202	Top	F	9	0402C	Chipcap X7R 10% 16V 0402	10n	16V

Item	Side	Grid ref.		Description and Value			
C4203	Top	D	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4400	Bottom	D	1	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4401	Bottom	C	1	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4402	Top	L	2	0402C	Chipcap 5% X7R	1n0	50V
C4403	Top	L	3	0402C	Chipcap 5% X7R	1n0	50V
C4800	Top	D	9	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4801	Top	G	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4802	Top	G	7	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4803	Top	D	9	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4804	Top	G	6	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4805	Top	D	6	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4806	Top	E	9	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4807	Top	F	9	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V

Item	Side	Grid ref.		Description and Value			
C4808	Top	F	5	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4809	Top	G	6	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4810	Top	G	6	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4811	Top	F	9	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4812	Top	G	6	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4813	Top	G	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C5000	Top	D	7	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5001	Top	D	7	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5002	Top	D	8	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5003	Top	D	7	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5004	Top	D	8	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V

Item	Side	Grid ref.		Description and Value			
C5005	Top	D	8	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5200	Top	H	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C6031	Top	H	9	0402C	Chipcap 5% NP0	15p	50V
C6032	Top	H	8	0402L	CHIP COIL 2N2+-0N3 Q30/800M 0402	2n2H	~
C6033	Top	G	9	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C6036	Top	G	8	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C6037	Top	G	9	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C6038	Top	H	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C6039	Top	H	8	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C6040	Top	G	9	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C6041	Top	H	8	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C6042	Top	H	8	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6043	Top	G	8	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C7501	Bottom	M	7	0402C	Chipcap 5% NP0	18p	50V

Item	Side	Grid ref.		Description and Value			
C7503	Bottom	M	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7504	Bottom	M	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7505	Bottom	L	6	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7507	Bottom	M	5	0402C	Chipcap 5% NP0	18p	50V
C7508	Bottom	L	5	0402C	Chipcap 5% NP0	18p	50V
C7509	Bottom	M	5	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7512	Top	P	3	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7513	Bottom	L	6	0402C	Chipcap X7R 10% 25V 0402	4n7	25V
C7514	Top	P	3	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7515	Bottom	K	6	0402C	Chipcap 5% NP0	10p	50V
C7516	Bottom	K	6	0402C	Chipcap 5% NP0	150p	50V
C7518	Bottom	N	7	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7520	Bottom	N	7	0402C	Chipcap 5% NP0	18p	50V
C7522	Bottom	K	5	0402C	Chipcap 5% NP0	150p	50V
C7523	Top	O	3	0402C	Chipcap +-0.25pF NP0	5p6	50V
C7524	Bottom	L	5	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2	16V

Item	Side	Grid ref.		Description and Value			
C7525	Top	O	3	0402C	Chipcap +-0.25pF NP0	5p6	50V
C7526	Bottom	K	7	0402C	Chipcap X7R 5% 16V 0402	10n	16V
C7527	Bottom	M	5	0402C	Chipcap 5% NP0	100p	50V
C7528	Bottom	M	5	0402C	Chipcap 5% NP0	22p	50V
C7529	Bottom	L	6	0402C	Chipcap 5% NP0	100p	50V
C7530	Bottom	L	7	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7531	Bottom	M	5	0402C	Chipcap 5% NP0	22p	50V
C7532	Bottom	L	6	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7533	Bottom	K	7	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C7534	Bottom	L	7	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7535	Bottom	L	6	0402C	Chipcap 5% NP0	100p	50V
C7536	Bottom	M	7	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7537	Top	P	4	0402C	Chipcap 5% NP0	100p	50V
C7538	Top	O	4	0402C	Chipcap 5% NP0	100p	50V
C7539	Top	P	4	0402C	Chipcap 5% NP0	100p	50V
C7540	Bottom	N	9	0402C	Chipcap 5% NP0	18p	50V
C7541	Bottom	N	9	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V

Item	Side	Grid ref.		Description and Value			
C7542	Bottom	N	9	0402C	Chipcap 5% NP0	18p	50V
C7543	Bottom	N	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7544	Top	M	5	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7545	Top	N	5	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7547	Bottom	N	9	0402C	Chipcap +-0.25pF NP0	1p8	50V
C7548	Bottom	N	9	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7549	Bottom	N	8	0402C	Chipcap 5% NP0	100p	50V
C7550	Bottom	L	9	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7552	Bottom	L	9	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7553	Bottom	L	9	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7554	Bottom	K	8	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7555	Bottom	K	8	0402C	CHIPCAP NP0 0P5 C 50V 0402	0p5	50V
C7556	Top	N	3	0402C	Chipcap 5% NP0	10p	50V
C7558	Bottom	N	8	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7559	Top	O	4	0402C	Chipcap +-0.25pF NP0	1p0	50V

Item	Side	Grid ref.		Description and Value			
C7560	Bottom	L	8	0402C	Chipcap X7R 10% 25V 0402	4n7	25V
C7561	Top	N	3	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7562	Bottom	N	9	0402C	CHIPCAP NP0 0P5 C 50V 0402	0p5	50V
C7563	Top	N	3	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7564	Top	O	4	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7567	Bottom	M	7	0402C	Chipcap 5% NP0	15p	50V
C7568	Bottom	M	9	0402C	Chipcap 5% NP0	150p	50V
C7569	Top	N	3	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7570	Bottom	L	8	0402C	Chipcap 5% NP0	18p	50V
C7571	Bottom	L	8	0402C	CHIPCAP NP0 330P J 50V 0402	330p	50V
C7573	Bottom	M	9	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2	16V
C7575	Bottom	M	8	0402C	Chipcap 5% NP0	15p	50V
C7576	Top	P	4	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7577	Bottom	M	8	0402C	Chipcap 5% NP0	15p	50V
C7578	Top	O	5	0402C	Chipcap 5% NP0	10p	50V
C7579	Top	P	6	0402C	Chipcap 5% NP0	10p	50V

Item	Side	Grid ref.		Description and Value			
C7580	Top	P	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7581	Top	P	3	0402C	Chipcap +-0.25pF NP0	5p6	50V
C7582	Bottom	L	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7583	Top	N	5	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7584	Top	O	3	0402C	Chipcap +-0.25pF NP0	5p6	50V
C7585	Top	O	6	0402C	CHIPCAP NP0 1P0 B 50V 0402	1p0	50V
C7586	Top	O	6	0402C	Chipcap 5% NP0	10p	50V
C7587	Top	O	6	0402C	Chipcap 5% NP0	10p	50V
C7588	Top	N	5	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C7589	Top	N	5	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7590	Top	O	5	0402C	Chipcap 5% NP0	10p	50V
C7591	Top	O	5	0402C	CHIPCAP NP0 470P J 6V3 0402	470p	6V3
C7592	Top	O	5	0402C	Chipcap 5% X7R	3n3	50V
C7593	Top	M	3	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7595	Top	M	4	0402C	Chipcap +-0.25pF NP0	1p2	50V
C7596	Bottom	N	6	0402C	Chipcap +-0.25pF NP0	2p7	50V

Item	Side	Grid ref.		Description and Value			
C7597	Bottom	M	2	TANT_6.3X3.5_H2.0	CHIPTCAP 100U M 14V 6X3.2X2	100u_14V	14V
C7598	Bottom	K	6	0402C	CHIPCAP NP0 0P5 C 50V 0402	0p5	50V
D1470	Bottom	B	1	PDSO_G5	OR-GATE 2INPUT 74LVC1G32 SC70-5	~	~
D1471	Top	B	5	P_TFBGA121	DSP TC39C01XBG 8.0X8.0X1.2 TFBGA121	~	~
D3000	Top	E	5	PBFREEBGA40_64MB_54MHZ_MAX	FLASH 4MX16 1.8/1.8V FBGA44	4Mx16	~
D3001	Top	H	2	SDRAM_110MHZ_64MBIT_BGA60_PBFREE_MAX	SDRAM 4MX16 1.8V/1.8V WBGA60 PBFREE	4Mx16	~
D4400	Top	G	3	DSBGA_5	NOR 2INPUT 74LVC1G02 6.5V DSBGA	~	~
D5000	Top	C	7	FBGA133	COMBO 512M DDR +512MNAND FBGA133 PBFREE	32Mx16/64Mx8	~
F2000	Bottom	F	1	0603_FUSE_AVX2MATS	SM FUSE F 2.0A 32V	2A	~
G7500	Bottom	L	6	VCO_FDK_WB002	VCO 3610-4340MHZ 2.7V 15MA	3610-4340MHz	~

Item	Side	Grid ref.		Description and Value			
G7501	Bottom	L	7	VCTCXO_KT21P2	VCTCXO 38.4MHZ 2.5V	38.4MHz	~
L1470	Top	I	1	COIL_LQH32CN	CHOKE 10U K 0R39 0.45A 1210	10uH	~
L1471	Top	K	1	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz	~
L1472	Top	K	1	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz	~
L2000	Bottom	E	1	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz	~
L2001	Bottom	K	2	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz	~
L2002	Bottom	K	2	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz	~
L2003	Bottom	L	2	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz	~
L2202	Top	L	3	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz	~
L2203	Top	J	4	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
L2204	Top	J	4	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~

Item	Side	Grid ref.		Description and Value			
L2205	Top	J	3	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz	~
L2206	Top	J	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
L2301	Top	J	6	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz	~
L2302	Top	K	6	CHOKE_ELL4LM100MN	CHOKE 10UM 0.69A 0R18 4X4X1.8	10uH	~
L2304	Top	M	5	CHOKE_984FB	CHOKE 22UM 1R4 0.33A 3.3X3.3X1.5	22uH	~
L2305	Top	M	6	FERRITE_BK1608	FERRITE BEAD 0R35 68R/100MHZ 0603	68R/100MHz	~
L4200	Top	D	9	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH	~
L4201	Top	F	9	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz	~
L4400	Bottom	D	1	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
L4401	Bottom	C	1	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~

Item	Side	Grid ref.		Description and Value			
L5200	Top	G	6	FERRITE_0 402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
L6030	Top	G	9	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L7400	Top	P	2	0402L	CHIP COIL 5N6 +-0N3 Q28/800M 0402	5n6H	~
L7502	Bottom	L	9	0402L_POL	CHIP COIL 82N J Q17/300M 0402	82nH	~
L7503	Bottom	N	9	FERRITE_0 402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
L7504	Top	P	3	0402L	CHIP COIL 27N J Q27/800M 0402	27nH	~
L7505	Top	P	3	0402L	CHIP COIL 12N J Q31/800M 0402	12nH	~
L7506	Top	O	3	0402L	CHIP COIL 12N J Q31/800M 0402	12nH	~
L7510	Bottom	M	8	0402L	CHIP COIL 4N7 +-0N3 Q28/800M 0402	4n7H	~
L7511	Bottom	M	7	0402L	CHIP COIL 10N J Q30/800M 0402	10nH	~
L7512	Bottom	M	8	0402L	CHIP COIL 4N7 +-0N3 Q28/800M 0402	4n7H	~

Item	Side	Grid ref.		Description and Value			
L7513	Bottom	N	7	0402L	CHIP COIL 1N8+-0N3 Q31/800M 0402	1n8H	~
L7514	Top	P	6	0402L	CHIP COIL 8N2 J Q28/800M HZ 0402	8n2H	~
L7515	Top	N	6	CHOKE_SER 400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH	~
L7516	Top	M	3	FERRITE_0 402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
L7517	Bottom	M	9	0402L	CHIP COIL 1N5 +-0N3 Q33/800M 0402	1n5H	~
N1470	Top	I	2	USMD_10_ 2.458X1.8 99	DC-DC CONV LM2708HT LX-1.57V/ 1.35V USMD10	~	~
N1471	Top	D	5	LLP_6	REG LP3981YD X 2.8/ NOPB 0.3A LLP-6	~	2.8V
N2200	Top	K	4	TFBGA_10 8	RETU 3.02 TSA1GJWE TFBGA108	~	~
N2300	Top	J	5	TFBGA_84_ 6.15X6.15	TAHVO V4.1 LEADFREE TFBGA84 6X6	~	~
N2301	Top	M	6	USMD8_1. 69X1.69	WHITE LED DRIVER 4LEDS 500MW 8BUMP USMD8	~	~

Item	Side	Grid ref.		Description and Value			
N4200	Top	E	9	USMD_10_2.458X1.899	DC_DC CONV LM2708H-1.40V/1.09V	~	~
N4201	Top	D	6	USMD4_1.313X1.033	REG 1.8V 4BUMPS 150MA LQ 40UA USMD4	~	1.8V
N6030	Top	G	8	uBGA63_4.6X4.6	BRF6150	~	~
N7500	Bottom	M	6	TFBGA_84_6.15X6.15	RF ASIC HINKU310A TFBGA84	~	~
N7501	Bottom	M	8	TFBGA64_H1.2	RF ASIC VINKU314A TFBGA64	~	~
N7502	Top	N	4	RITSA_PA_REL3	PW AMP PF09014B_CUT5.3 QUADBAND	~	~
N7503	Top	P	5	PW_AMP_PF57603B	PW AMP PF57603B CUT8.1 1920-1980MHZ	~	~
N7504	Top	N	5	USMD10_2.534X2.026	DC CONV SUPA LM2706 PBFREE	~	~
R1470	Top	G	7	0402R	Resistor 5% 63mW	100R	~
R1471	Top	F	7	0402R	Resistor 5% 63mW	100R	~
R1472	Top	G	6	0402R	Resistor 5% 63mW	3k3	~
R1473	Top	G	6	0402R	Resistor 5% 63mW	3k3	~
R1474	Top	G	2	0402R	Resistor 5% 63mW	150R	~
R1475	Top	C	6	0402R	Resistor 5% 63mW	1k0	~

Item	Side	Grid ref.		Description and Value			
R1476	Top	C	5	0402R	Resistor 5% 63mW	100R	~
R1477	Top	C	5	0402R	Resistor 5% 63mW	100R	~
R1478	Bottom	C	1	0402R	Resistor 5% 63mW	2k2	~
R1479	Bottom	C	1	0402R	Resistor 5% 63mW	2k2	~
R1480	Top	G	2	0402R	Chipres 0W06 jumper 0402	0R	~
R1483	Top	D	6	0402R	Resistor 5% 63mW	100k	~
R1484	Top	I	2	0402R	Resistor 5% 63mW	1k0	~
R2000	Top	K	2	0402R	Resistor 5% 63mW	220R	~
R2001	Top	J	2	uBGA11_2.15X1.65	ASIP MIC W/ESD RES +CAP+ZDI BGA11	~	~
R2002	Bottom	K	2	0402R	Resistor 5% 63mW	10R	~
R2003	Bottom	K	2	0402R	Resistor 5% 63mW	10R	~
R2004	Bottom	L	2	0402R	Resistor 5% 63mW	10R	~
R2005	Bottom	L	2	0402R	Resistor 5% 63mW	10R	~
R2006	Bottom	K	2	uBGA5	ASIP 4XESD **PB-FREE** BGA5	~	~
R2007	Top	H	1	uBGA11_1.6X2.15	ASIP SILIC USB OTG / ESD BGA11	~	~
R2008	Top	H	1	0404_RP	RES NETWORK 0W06 220K/ 120K J 0404	220k/ 120k	~

Item	Side	Grid ref.		Description and Value			
R2009	Top	H	1	0402R	Resistor 5% 63mW	100R	~
R2070	Bottom	K	2	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2071	Bottom	K	5	0402_NTH 5	NTC RES 47K J B=4050 +-3% 0402	47k	~
R2100	Top	O	9	FLIP_CHIP_ 8_1.7X1.7	ASIP SINGLE ENDED MICROPHO NE INTERF BGA8	~	~
R2101	Top	L	5	0402R	Resistor 5% 63mW	220R	~
R211	Top	J	5	0402R	Resistor 5% 63mW	47R	~
R2200	Top	L	5	0402R	Resistor 5% 63mW	100k	~
R2201	Top	I	4	0402R	Resistor 5% 63mW	120k	~
R2203	Top	K	5	0402R	Chipres 0W06 5% 0402	3M3	~
R2301	Top	J	6	0402R	Resistor 5% 63mW	4k7	~
R2302	Top	M	6	0402R	Resistor 5% 63mW	10k	~
R2303	Top	L	1	0402R	Resistor 5% 63mW	1k0	~
R2304	Top	L	1	0402R	Resistor 5% 63mW	39R	~
R2305	Top	L	2	0402R	Resistor 5% 63mW	33R	~
R2307	Top	K	2	0402R	Resistor 5% 63mW	39k	~
R2308	Top	K	3	0402R	Resistor 5% 63mW	1k0	~

Item	Side	Grid ref.		Description and Value			
R2700	Bottom	M	4	uBGA8	ASIP EMIF03-SIM01F2 **PB-FREE**	~	~
R3000	Top	F	4	0402R	Resistor 5% 63mW	4k7	~
R4400	Top	L	2	0402R	Chipres 0W06 jumper 0402	0R	~
R4401	Top	L	3	0402R	Chipres 0W06 jumper 0402	0R	~
R4402	Top	G	3	0402R	Resistor 5% 63mW	47R	~
R4800	Top	D	9	0402R	Resistor 5% 63mW	10R	~
R4801	Top	F	9	0402R	Resistor 5% 63mW	100k	~
R4809	Top	F	6	0402R	Resistor 5% 63mW	1k0	~
R5100	Top	F	9	0402R	Resistor 5% 63mW	10k	~
R5200	Top	G	7	uBGA11_1.62X2.12	ASIP EMIF04-MMC02F2**PB-FREE**	~	~
R5204	Bottom	E	10	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7501	Bottom	K	5	0402R	Resistor 5% 63mW	1k0	~
R7503	Bottom	L	8	0402R	Resistor 5% 63mW	4k7	~
R7504	Bottom	M	7	0402R	CHIPRES 0W06 10K F 0402	10k	~

Item	Side	Grid ref.		Description and Value			
R7505	Bottom	K	5	0402R	CHIPRES 0W06 8K2 F 0402	8k2	~
R7506	Top	N	3	0402R	Resistor 5% 63mW	33R	~
R7509	Bottom	K	7	0402R	Resistor 5% 63mW	22k	~
R7512	Top	M	3	0404_RAC 10	RES NETWORK 0W04 2DB ATT 0404	436R/ 11R6/436 R	~
R7514	Bottom	N	8	0402R	Resistor 5% 63mW	12k	~
R7516	Top	O	4	0402R	Resistor 5% 63mW	1k0	~
R7517	Top	O	4	0402R	Resistor 5% 63mW	3k3	~
R7518	Top	N	5	0402R	Resistor 5% 63mW	470k	~
R7519	Bottom	M	9	0402R	Resistor 5% 63mW	1k0	~
R7520	Bottom	M	8	0402R	Resistor 5% 63mW	270R	~
R7521	Bottom	N	8	0402R	CHIPRES 0W06 10K F 0402	10k	~
R7522	Top	O	5	0402R	Resistor 5% 63mW	220k	~
R7523	Bottom	M	9	0402R	CHIPRES 0W06 9K1 F 100PPM 0402	9k1	~
R7525	Top	O	5	0402R	Resistor 5% 63mW	10R	~
R7526	Top	O	6	0402R	Resistor 5% 63mW	5k6	~
R7527	Top	O	6	0402R	Resistor 5% 63mW	220R	~
R7528	Bottom	M	9	0402R	Resistor 5% 63mW	470k	~
R7529	Top	O	5	0402R	Resistor 5% 63mW	2k2	~

Item	Side	Grid ref.		Description and Value			
R7530	Top	O	5	0402R	Resistor 5% 63mW	8k2	~
R7531	Top	O	5	0402R	Resistor 5% 63mW	8k2	~
R7534	Top	N	5	0402R	Resistor 5% 63mW	470k	~
S5200	Bottom	H	9	SWITCH_JP S1110_52 01F	SWITCH SPST 5V 0.01A	~	~
T7500	Bottom	N	6	TRANS_LD B15	TRANSF BALUN 2134 +-90MHZ 0805	~	~
T7501	Bottom	L	5	TRANS_LD B15	TRANSF BALUN 3800 +-550MHZ 0805	~	~
T7502	Top	M	3	TRANS_LD B15	TRANSF BALUN 1800 +-100mhz 2x1.25	~	~
T7503	Bottom	K	9	TRANS_LD B15	TRANSF BALUN 3800 +-550MHZ 0805	~	~
V2000	Bottom	E	1	CASE_457	TVS DI 1PMT16AT 3 16V 175W PWRMITE	~	~
V2300	Top	L	6	VMT3_R	TR DTC143ZM N RB=4K7 RBE=47K VMT3	~	~
V2301	Top	K	2	VMT3	TR 2SC5658Q RS N 50V 0A1 0W15 VMT3	~	~

Item	Side	Grid ref.		Description and Value			
V2303	Top	K	2	VMT3	TR 2SC5658Q RS N 50V 0A1 0W15 VMT3	~	~
V7500	Top	O	6	SOT_563	SCHDIX2 RF DETECTOR CT 1PF 0V39 SOT666	~	~
W1	Bottom	J	9	ANTENNA_G1_BT	MURATA CERAMIC BT ANTENNA G1 SERIES	~	~
I220	Bottom	H	1	CON_JACK_HR33NK_2DJA_2S	CONN DC-JACK 2.0MM 3POL SPR 90DEG	~	~
X2001	Bottom	K	1	SYSCON_MQ202_NK_14R3	SM SYSTEM CONNECTOR 14POL	~	~
X2061	Bottom	O	3	TRACEABILITY_PAD	MODULE ID COMPONENT 2.8X1.8X0.3	~	~
X2070	Bottom	K	3	CONN_CY_5225_1817H	SM BATTERY CONN 3POLE SPR	~	~
X2700	Bottom	M	4	SIM_CONN_C707_10M006_139_2	CONN SIM 2X3POL P2.54	~	~
X4400	Top	E	3	MOLEX_500024_5008	SM CONN 2X25F P0.4 PWB/PWB	~	~
X4401	Top	M	1	MOLEX_51338_0304	SM CONN BTB 2X15F P0.4	~	~

Item	Side	Grid ref.		Description and Value			
X5200	Top	K	8	CONN_CT7_00220_200	CONN MMC 6P RS PUSH-PUSH	~	~
X7400	Bottom	O	2	RF_SWITCH_MS_156	SM RF SWITCH MS156 DNS05952 HDC13	~	~
Z1470	Top	J	2	FC6_1.65X1.15	ASIP 2-CH MIC EMI/ESD **PB-FREE**	~	~
Z2000	Bottom	I	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
Z2001	Bottom	I	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
Z2003	Bottom	I	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
Z4400	Top	K	1	uBGA25_2.69X2.69	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z4405	Top	J	1	uBGA25_2.69X2.69	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z6030	Top	H	9	EZFVQ42NM77S_V2	LTCC FILT 2441.75 +-41.75MHZ 2.0X1.5	2441.75MHz	~
Z7500	Top	M	3	FERRITE_FBMJ1608	FERRITE BEAD 0R01 28R/100MHZ 0603	28R/100MHz	~

Item	Side	Grid ref.		Description and Value			
Z7501	Bottom	N	5	FILTER_SAW_2.1X1.7_H0.8	SAW FILTER 2140 +-30MHZ/4DB 2X1.6	2140MHz	~
Z7502	Top	O	8	DFYK61G95LBJCB	DUPL 1920-1980/2110-2170MHZ 9X4.3	1920-1980/2110-2170MHz	~
Z7503	Top	O	3	ANT_SW_LMSP_0094	ANT.SW +3SAW 880-960/1710-1990 MHZ	~	~
Z7504	Top	M	4	FILTER_SAW_2.0X1.6_H0.68	SAW FILTER 897.5 +-17.5MHZ 2X1.6MM	897.5MHz	~
Z7505	Top	P	6	ISOLATOR_CEZ0047	ISOLATOR 1950 +-30MHZ 13DB 3.35X3.35	~	~
Z7506	Bottom	N	7	FILTER_SAW_2.1X1.7_H0.9	SAW FILTER 1950 +-30MHZ 2.0X1.6	1950MHz	~
A3000	BTM	D	3	SHIELD_DMC07004	FLASH CAN DMC07004 RM-1	~	~
A6000	BTM	G	3	SHIELD_DMC07003	BT CAN DMC07003 RM-1	~	~
A7000	BTM	L	6	SHIELD_DMC07006	RF ENGINE CAN DMC07006 RM-1	~	~
A7001	BTM	O	9	SHIELD_DMC07007	WDCMA PA CAN DMC07007 RM-1	~	~

Item	Side	Grid ref.		Description and Value			
A7002	BTM	R	3	SHIELD_DMC07005	GSM PA CAN DMC07005 RM-1	~	~
A7003	BTM	M	9	SHIELD_DMD11427	VCO CAN DMD11427 RM-1	~	~
B2200	Top	C	4	CRYSTAL_3.3X1.6	CRYSTAL 32.768KHZ +-20PPM 12.5PF	32.768kHz	~
C1470	BTM	R	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1471	BTM	O	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1472	BTM	D	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1473	BTM	D	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2000	BTM	B	9	0402C	Chipcap 5% NP0	27p	50V
C2002	BTM	D	5	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C2003	Top	B	5	0402C	CERCAP X7R 22N K 16V 0402	22n	16V
C2004	Top	B	5	0402C	CERCAP X7R 22N K 16V 0402	22n	16V
C2005	Top	B	5	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2006	Top	B	5	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2007	BTM	B	4	0402C	Chipcap X7R 10% 16V 0402	10n	16V

Item	Side	Grid ref.		Description and Value			
C2008	BTM	A	4	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2009	BTM	C	4	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2010	BTM	B	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2011	BTM	D	6	0402C	CHIPCAP NP0 270P J 25V 0402	270p	25V
C2012	BTM	B	9	0603C	CHIPCAP X5R 1U K 25V 0603	1u0	25V
C2070	BTM	H	3	TANT_6.3X 3.5_H2.0	CHIPTCAP 100U M 14V 6X3.2X2	100u_14V	14V
C2100	Top	B	5	0402C	CHIPCAP X7R 15N K 16V 0402	15n	16V
C2101	Top	B	5	0402C	CHIPCAP X7R 15N K 16V 0402	15n	16V
C2102	Top	B	5	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C2105	Top	B	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2106	Top	B	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2107	Top	B	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2108	Top	B	8	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2109	Top	B	8	0402C	Chipcap X7R 10% 50V 0402	1n0	50V

Item	Side	Grid ref.		Description and Value			
C2110	Top	B	8	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2200	Top	B	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2201	Top	D	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2202	Top	C	4	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2203	Top	C	4	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2204	Top	B	4	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2205	Top	B	4	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2206	Top	B	4	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2207	Top	D	4	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2208	Top	C	4	0402C	Chipcap 5% NP0	27p	50V
C2209	Top	C	4	0402C	Chipcap 5% NP0	22p	50V
C2210	Top	D	6	0603C	CHIPCAP X5R 1U K 16V 0603	1u0	16V
C2211	Top	C	7	0805C	CHIPCAP X5R 4U7 K 10V 0805	4u7	10V
C2212	Top	C	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2213	Top	E	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V

Item	Side	Grid ref.		Description and Value			
C2214	Top	D	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2215	Top	D	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2216	Top	D	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2217	Top	E	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2219	Top	D	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2220	Top	D	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2221	Top	D	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2222	Top	D	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2223	Top	C	4	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2224	Top	D	5	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2225	Top	D	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2226	Top	C	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2227	Top	D	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2228	Top	E	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V

Item	Side	Grid ref.		Description and Value			
C2230	Top	E	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2231	Top	B	6	0805C	CHIPCAP X5R 10U M 6V3 0805	10U	6V3
C2232	Top	D	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2233	BTM	D	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2234	Top	C	4	0402C	Chipcap 5% NP0	27p	50V
C2235	Top	C	3	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2237	Top	E	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2240	Top	E	9	0402C	Chipcap 5% NP0	12p	50V
C2241	Top	D	4	0402C	Chipcap 5% NP0	12p	50V
C2242	Top	E	8	0402C	Chipcap 5% NP0	12p	50V
C2243	Top	F	6	0402C	Chipcap 5% NP0	12p	50V
C2244	Top	F	11	0402C	Chipcap 5% NP0	12p	50V
C2300	Top	C	9	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2301	Top	C	8	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2302	Top	B	7	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2303	Top	E	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V

Item	Side	Grid ref.		Description and Value			
C2304	Top	C	8	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2306	Top	D	9	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2307	Top	C	9	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2309	Top	B	8	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2312	Top	D	9	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2313	Top	D	9	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2314	Top	D	10	0805C	CHIPCAP X5R 4U7 K 25V 0805	4u7	25V
C2315	Top	C	10	0805C	CHIPCAP X5R 4U7 K 25V 0805	4u7	25V
C2316	Top	C	8	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2700	BTM	G	11	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2800	BTM	F	4	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2801	Top	H	4	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2802	Top	F	3	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V

Item	Side	Grid ref.		Description and Value			
C2803	Top	E	5	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2804	Top	E	3	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2805	Top	G	6	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2806	Top	H	4	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2807	Top	H	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2808	Top	H	4	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2809	BTM	G	4	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2810	Top	G	6	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2811	Top	H	5	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2812	Top	E	5	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2813	Top	E	4	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V

Item	Side	Grid ref.		Description and Value			
C2814	Top	F	3	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3000	Top	C	3	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3001	Top	D	4	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3002	Top	C	3	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3003	Top	D	4	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C3004	Top	E	1	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3005	Top	E	3	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3006	Top	E	4	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3007	Top	C	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C3008	Top	D	4	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4200	Top	C	7	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C4201	Top	C	7	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3

Item	Side	Grid ref.		Description and Value			
C4202	Top	D	8	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C4400	BTM	O	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4401	BTM	R	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4402	BTM	Q	10	0402C	Chipcap 5% NP0	27p	50V
C4800	Top	F	9	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4801	Top	E	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4802	Top	E	8	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4803	Top	E	6	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4804	Top	G	9	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4805	Top	H	7	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4806	Top	H	6	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4807	Top	E	8	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V

Item	Side	Grid ref.		Description and Value			
C4808	Top	E	8	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4809	Top	H	7	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4810	Top	G	9	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4811	Top	F	6	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4812	Top	E	7	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4813	Top	E	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C5000	Top	F	11	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5001	Top	E	9	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5002	Top	G	11	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5003	Top	F	9	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5004	Top	E	11	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V

Item	Side	Grid ref.		Description and Value			
C5005	Top	E	9	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5006	Top	F	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C5200	BTM	H	2	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C6031	BTM	F	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6033	BTM	F	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6035	BTM	G	2	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6036	BTM	G	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C6042	BTM	G	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C6043	BTM	F	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6044	BTM	F	2	0402C	Chipcap 5% NP0	15p	50V
C6045	BTM	G	2	0402C	Chipcap 5% NP0	15p	50V
C6046	BTM	G	1	0402C	Chipcap +-0.25pF NP0	1p0	50V
C6047	BTM	G	2	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C6048	BTM	F	2	0402C	Chipcap +-0.25pF NP0	5p6	50V
C7501	BTM	N	7	0402C	Chipcap 5% NP0	18p	50V

Item	Side	Grid ref.		Description and Value			
C7503	BTM	M	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7504	BTM	M	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7505	BTM	L	7	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7507	BTM	M	6	0402C	Chipcap 5% NP0	18p	50V
C7508	BTM	M	6	0402C	Chipcap 5% NP0	18p	50V
C7509	BTM	M	6	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7512	BTM	S	4	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7513	BTM	L	6	0402C	Chipcap X7R 10% 25V 0402	4n7	25V
C7514	BTM	S	4	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7515	BTM	K	7	0402C	Chipcap 5% NP0	10p	50V
C7516	BTM	K	6	0402C	Chipcap 5% NP0	150p	50V
C7518	BTM	N	7	0402C	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7520	BTM	N	7	0402C	Chipcap 5% NP0	18p	50V
C7522	BTM	L	6	0402C	Chipcap 5% NP0	150p	50V
C7523	BTM	R	4	0402C	Chipcap +-0.25pF NP0	5p6	50V
C7524	BTM	K	5	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2	16V

Item	Side	Grid ref.		Description and Value			
C7525	BTM	R	4	0402C	Chipcap +-0.25pF NP0	5p6	50V
C7527	BTM	M	6	0402C	Chipcap 5% NP0	100p	50V
C7528	BTM	M	6	0402C	Chipcap 5% NP0	22p	50V
C7529	BTM	L	7	0402C	Chipcap 5% NP0	100p	50V
C7530	BTM	L	7	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7531	BTM	M	6	0402C	Chipcap 5% NP0	22p	50V
C7532	BTM	L	7	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7533	BTM	K	7	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C7534	BTM	M	7	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7535	BTM	L	6	0402C	Chipcap 5% NP0	100p	50V
C7536	BTM	M	7	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7541	BTM	K	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7543	BTM	K	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7545	BTM	Q	2	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7547	BTM	J	7	0402C	Chipcap +-0.25pF NP0	1p8	50V
C7548	BTM	J	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V

Item	Side	Grid ref.		Description and Value			
C7549	BTM	K	6	0402C	Chipcap 5% NP0	100p	50V
C7550	BTM	I	7	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7552	BTM	I	7	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7553	BTM	I	7	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7554	BTM	M	10	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7555	BTM	M	10	0402C	CHIPCAP NP0 0P5 C 50V 0402	0p5	50V
C7556	BTM	Q	4	0402C	Chipcap 5% NP0	10p	50V
C7558	BTM	J	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7559	BTM	R	2	0402C	Chipcap +-0.25pF NP0	1p0	50V
C7560	BTM	I	7	0402C	Chipcap X7R 10% 25V 0402	4n7	25V
C7561	BTM	Q	4	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7563	BTM	Q	4	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7564	BTM	R	3	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7567	BTM	J	6	0402C	Chipcap 5% NP0	15p	50V
C7568	BTM	I	7	0402C	Chipcap 5% NP0	150p	50V
C7569	BTM	R	4	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V

Item	Side	Grid ref.		Description and Value			
C7570	BTM	I	6	0402C	Chipcap 5% NP0	18p	50V
C7571	BTM	L	10	0402C	CHIPCAP NP0 330P J 50V 0402	330p	50V
C7573	BTM	I	7	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2	16V
C7575	BTM	I	6	0402C	Chipcap 5% NP0	15p	50V
C7577	BTM	I	6	0402C	Chipcap 5% NP0	15p	50V
C7579	BTM	N	11	0402C	Chipcap 5% NP0	10p	50V
C7580	BTM	O	10	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7581	BTM	S	4	0402C	Chipcap +-0.25pF NP0	5p6	50V
C7582	BTM	I	7	0402C	Chipcap 5% NP0	100p	50V
C7583	BTM	N	8	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7584	BTM	S	4	0402C	Chipcap +-0.25pF NP0	5p6	50V
C7585	BTM	O	10	0402C	CHIPCAP NP0 1P0 B 50V 0402	1p0	50V
C7586	BTM	P	9	0402C	Chipcap 5% NP0	10p	50V
C7587	BTM	P	9	0402C	Chipcap 5% NP0	10p	50V
C7589	BTM	O	8	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7590	BTM	O	9	0402C	Chipcap 5% NP0	10p	50V
C7591	BTM	N	9	0402C	CHIPCAP NP0 470P J 6V3 0402	470p	6V3

Item	Side	Grid ref.		Description and Value			
C7592	BTM	N	9	0402C	Chipcap 5% X7R	3n3	50V
C7593	BTM	Q	4	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7596	BTM	N	6	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7597	BTM	O	4	TANT_6.3X3.5_H2.0	CHIPTCAP 100U M 14V 6X3.2X2	100u_14V	14V
C7598	BTM	K	7	0402C	CHIPCAP NP0 0P5 C 50V 0402	0p5	50V
D2800	Top	G	4	uBGA_289	RAP3G V2.1E-PA UMC8D F761800B 027 U*BGA	~	~
D3000	BTM	D	3	PBFREEBGA40_64MB_54MHZ_MAX	FLASH 4MX16 1.8/1.8V FBGA44	4Mx16	~
D3001	Top	D	2	SDRAM_110MHZ_64MBIT_BGA60_PBFREE_MAX	SDRAM 4MX16 1.8V/1.8V WBGA60 PBFREE	4Mx16	~
D4800	Top	F	7	uBGA_289	HELEN3 PS1.1E F761991A C027 UBGA289	~	~
D5000	Top	F	10	FBGA121_H1.1	COMBO 256M DDR + 256M NAND FBGA121 PBFREE	256M_DDR / 256M_NAND	~
F2000	BTM	A	9	0603_FUSE_AVX2MATS	SM FUSE F 2.0A 32V	2A	~

Item	Side	Grid ref.		Description and Value			
G2200	BTM	F	11	BATTER_RB414H	CELL CAPACITOR 0.01MAH 3V3	3V3	~
G7500	BTM	K	6	VCO_FDK_IT_H1.7	VCO 3610-4340MHZ 2.7V 13MA WCDMA FDD	3610-4340MHz	~
G7501	BTM	L	7	NKG3176B_H1.0	VCTCXO 38.4MHZ 2.5V	38.4MHz	~
G7502	BTM	M	9	VCO_FDK_IT_H1.7	VCO 3420-3960MHZ 2.7V 14MA WCDMA FDD	3420-3960MHz	~
L2000	BTM	B	8	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz	~
L2001	Top	B	6	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz	~
L2002	BTM	B	4	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz	~
L2003	BTM	B	4	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz	~
L2100	Top	U	3	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz	~
L2101	Top	B	6	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz	~

Item	Side	Grid ref.		Description and Value			
L2102	BTM	S	5	COIL_0603 CS	CHIP COIL 56N J Q38/250M HZ 0603	56nH	~
L2103	BTM	S	6	COIL_0603 CS	CHIP COIL 56N J Q38/250M HZ 0603	56nH	~
L2104	Top	B	6	0603_BLM	FERR.BEAD 220R/ 100M 2A 0R05 0603	220R/ 100MHz	~
L2105	Top	B	8	0402L_XL	FERRITE BEAD 220R 0R45 0.3A 0402	220R/ 100MHz	~
L2106	Top	B	8	0402L_XL	FERRITE BEAD 220R 0R45 0.3A 0402	220R/ 100MHz	~
L2202	Top	E	4	0603_BLM	FERR.BEAD 220R/ 100M 2A 0R05 0603	220R/ 100MHz	~
L2203	Top	E	5	FERRITE_0 402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
L2204	Top	D	5	FERRITE_0 402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
L2205	Top	C	6	0603_BLM	FERR.BEAD 220R/ 100M 2A 0R05 0603	220R/ 100MHz	~
L2206	Top	E	5	FERRITE_0 402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~

Item	Side	Grid ref.		Description and Value			
L2207	BTM	E	11	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
L2301	Top	B	8	0603_BLM	FERR.BEAD 220R/ 100M 2A 0R05 0603	220R/ 100MHz	~
L2302	Top	B	7	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH	~
L2304	Top	D	10	CHOKE_984FB	CHOKE 22U M 1R4 0.33A 3.3X3.3X1.5	22uH	~
L4200	Top	D	7	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH	~
L4201	Top	E	7	0603_BLM	FERR.BEAD 220R/ 100M 2A 0R05 0603	220R/ 100MHz	~
L4400	BTM	O	7	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
L4401	BTM	R	5	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
L5200	BTM	I	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
L6031	BTM	G	2	0402L	CHIP COIL 2N7+-0N3 Q29/800M 0402	2n7H	~

Item	Side	Grid ref.		Description and Value			
L6032	BTM	G	2	0402L	CHIP COIL 2N7+-0N3 Q29/800M 0402	2n7H	~
L6033	BTM	F	2	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L6034	BTM	F	2	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L7502	BTM	I	7	0402L	CHIP COIL 100N J Q16/300M 0402	100nH	~
L7503	BTM	K	7	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
L7504	BTM	S	4	0402L	CHIP COIL 27N J Q27/800M 0402	27nH	~
L7505	BTM	S	4	0402L	CHIP COIL 12N J Q31/800M 0402	12nH	~
L7506	BTM	R	4	0402L	CHIP COIL 12N J Q31/800M 0402	12nH	~
L7510	BTM	J	6	0402L	CHIP COIL 4N7 +-0N3 Q28/800M 0402	4n7H	~
L7511	BTM	J	6	0402L	CHIP COIL 10N J Q30/800M 0402	10nH	~
L7512	BTM	J	6	0402L	CHIP COIL 4N7 +-0N3 Q28/800M 0402	4n7H	~

Item	Side	Grid ref.		Description and Value			
L7514	BTM	O	10	0402L	CHIP COIL 8N2 J Q28/800M HZ 0402	8n2H	~
L7515	BTM	P	9	CHOKE_SER 400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH	~
L7516	BTM	P	4	FERRITE_0 402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
L7517	BTM	J	7	0402L	CHIP COIL 1N5 +-0N3 Q33/800M 0402	1n5H	~
N1470	BTM	D	5	LLP6	REG LP3990YD X-1.5V LLP-6	~	1.5V
N2200	Top	C	5	TFBGA_10 8	RETU 3.02 L TSA1GJWE TFBGA108	~	~
N2300	Top	D	8	TFBGA_84_ 6.15X6.15	TAHVO V4.1 TFBGA84 6X6	~	~
N2301	Top	D	10	USMD8_1. 69X1.69	WHITE LED DRIVER 4LEDS 500MW 8BUMP USMD8	~	~
N4200	Top	C	7	USMD_10_ 2.458X1.8 99	DC_DC CONV LM2708H- 1.40V/ 1.09V	~	~
N6030	BTM	G	3	TFBGA84_ H1.0	BC3-ROM WITH BC2 MOULD MATERIAL	~	~

Item	Side	Grid ref.		Description and Value			
N6031	BTM	G	3	USMD5_1.468X1.036	VREG 2.85/150MA LP3987-2.85 USMD5	~	2.85V
N7500	BTM	M	6	TFBGA_84_6.15X6.15	RF ASIC HINKU310A TFBGA84	~	~
N7501	BTM	J	7	TFBGA64_H1.2	RF ASIC VINKU314A TFBGA64	~	~
N7502	BTM	Q	3	RITSA_PA_REL3	PW AMP RF9292E9.2 QUADBAND	~	~
N7503	BTM	O	10	RF9252E2.1	PW AMP RF9252E8.2 1920-1980MHZ	~	~
N7504	BTM	O	9	USMD10_2.534X2.026	DC CONV SUPA LM2706 PBFREE	~	~
R1470	Top	H	6	0402R	Resistor 5% 63mW	100R	~
R1471	Top	H	6	0402R	Resistor 5% 63mW	100R	~
R1472	Top	H	8	0402R	Resistor 5% 63mW	3k3	~
R1473	Top	H	8	0402R	Resistor 5% 63mW	3k3	~
R1474	Top	G	6	0402R	Resistor 5% 63mW	33R	~
R2000	BTM	D	5	0402R	Resistor 5% 63mW	220R	~
R2001	Top	B	5	uBGA11_2.15X1.65	ASIP MIC W/ESD RES +CAP+ZDI BGA11	~	~
R2002	BTM	B	4	0402R	Resistor 5% 63mW	10R	~

Item	Side	Grid ref.		Description and Value			
R2003	BTM	C	4	0402R	Resistor 5% 63mW	10R	~
R2004	BTM	C	4	0402R	Resistor 5% 63mW	10R	~
R2005	BTM	C	4	0402R	Resistor 5% 63mW	10R	~
R2006	BTM	B	4	uBGA5	ASIP 4XESD **PB-FREE** BGA5	~	~
R2007	BTM	B	6	uBGA11_1.6X2.1	ASIP SILIC USB OTG / ESD BGA11	~	~
R2009	BTM	C	6	0402R	Resistor 5% 63mW	100R	~
R2010	BTM	C	6	0402R	Resistor 5% 63mW	220k	~
R2011	BTM	D	5	0402R	Resistor 5% 63mW	120k	~
R2012	BTM	D	5	0402R	Resistor 5% 63mW	100k	~
R2013	BTM	D	4	0402R	Resistor 5% 63mW	330R	~
R2014	BTM	D	4	0402R	Resistor 5% 63mW	1M0	~
R2070	BTM	B	8	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2071	Top	C	2	0402_NTH5	NTC RES 47K J B=4050 +-3% 0402	47k	~
R2100	Top	B	5	FLIP_CHIP_8_1.7X1.7	ASIP SINGLE ENDED MICROPHONE INTERF BGA8	~	~
R2101	Top	B	5	0402R	Resistor 5% 63mW	220R	~

Item	Side	Grid ref.		Description and Value			
R2104	Top	U	4	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2105	Top	U	4	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2106	BTM	S	5	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2107	BTM	S	5	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2200	Top	C	4	0402R	Resistor 5% 63mW	100k	~
R2201	Top	D	4	0402R	Resistor 5% 63mW	120k	~
R2202	BTM	E	11	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2205	Top	C	4	0402R	CHIPRES 0W06 2M2 J 0402	2M2	~
R2301	Top	C	10	0402R	Resistor 5% 63mW	4k7	~
R2302	Top	D	11	0402R	Resistor 5% 63mW	10k	~
R2303	Top	C	10	0402R	Resistor 5% 63mW	1k0	~
R2304	Top	C	10	0402R	Resistor 5% 63mW	39R	~
R2305	Top	E	8	0402R	Resistor 5% 63mW	33R	~

Item	Side	Grid ref.		Description and Value			
R2700	BTM	E	11	uBGA8	ASIP EMIF03-SIM01F2 **PB-FREE**	~	~
R3000	Top	H	3	0402R	Resistor 5% 63mW	4k7	~
R4400	Top	B	4	0402R	Resistor 5% 63mW	470k	~
R4401	Top	C	4	0402R	Resistor 5% 63mW	100k	~
R4402	Top	B	4	0402R	Resistor 5% 63mW	470k	~
R4403	Top	U	4	0402_NTH 5	NTC RES 47K J B=4050 +-3% 0402	47k	~
R4404	BTM	Q	10	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R4405	BTM	Q	10	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R4406	BTM	Q	2	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R4408	Top	E	1	0603_VAR	CHIP VARISTOR VWM19V VC27V 0603	19V/27V	~
R4409	Top	F	1	0603_VAR	CHIP VARISTOR VWM19V VC27V 0603	19V/27V	~
R4800	Top	F	9	0402R	Resistor 5% 63mW	10R	~

Item	Side	Grid ref.		Description and Value			
R4809	Top	E	6	0402R	Resistor 5% 63mW	1k0	~
R5100	Top	H	6	0402R	Resistor 5% 63mW	10k	~
R5200	BTM	H	2	uBGA11_1.62X2.12	ASIP EMIF04-MMC02F2**PB-FREE**	~	~
R5204	BTM	O	3	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R6030	BTM	G	3	0402R	Resistor 5% 63mW	10k	~
R6034	BTM	F	2	0402R	CHIPRES 0W06 2R2 J 0402	2R2	~
R7501	BTM	K	6	0402R	Resistor 5% 63mW	1k0	~
R7503	BTM	I	6	0402R	Resistor 5% 63mW	4k7	~
R7504	BTM	M	7	0402R	CHIPRES 0W06 10K F 0402	10k	~
R7505	BTM	L	6	0402R	CHIPRES 0W06 8K2 F 0402	8k2	~
R7506	BTM	Q	4	0402R	Resistor 5% 63mW	270R	~
R7509	BTM	K	7	0402R	Resistor 5% 63mW	22k	~
R7512	BTM	P	4	0404_RAC10	RES NETWORK 0W04 2DB ATT 0404	436R/11R6/436R	~
R7514	BTM	K	6	0402R	Resistor 5% 63mW	12k	~
R7516	BTM	R	3	0402R	Resistor 5% 63mW	1k0	~
R7518	BTM	Q	2	0402R	Resistor 5% 63mW	470k	~

Item	Side	Grid ref.		Description and Value			
R7519	BTM	J	7	0402R	Resistor 5% 63mW	1k0	~
R7520	BTM	J	6	0402R	Resistor 5% 63mW	270R	~
R7521	BTM	J	6	0402R	CHIPRES 0W06 10K F 0402	10k	~
R7522	BTM	N	8	0402R	Resistor 5% 63mW	220k	~
R7523	BTM	I	7	0402R	CHIPRES 0W06 9K1 F 100PPM 0402	9k1	~
R7525	BTM	N	9	0402R	Resistor 5% 63mW	10R	~
R7526	BTM	O	9	0402R	Resistor 5% 63mW	5k6	~
R7527	BTM	O	9	0402R	Resistor 5% 63mW	220R	~
R7528	BTM	J	7	0402R	Resistor 5% 63mW	470k	~
R7529	BTM	O	9	0402R	Resistor 5% 63mW	2k2	~
R7530	BTM	N	9	0402R	Resistor 5% 63mW	8k2	~
R7531	BTM	N	9	0402R	Resistor 5% 63mW	8k2	~
R7534	BTM	R	2	0402R	Resistor 5% 63mW	470k	~
S4400	BTM	R	11	SWITCH_SKRE_II	SM TACT SW TRAV 0.2 4.1X3.55X 1.75	~	~
S4401	BTM	R	2	SWITCH_SKRE_II	SM TACT SW TRAV 0.2 4.1X3.55X 1.75	~	~
S5200	BTM	O	2	SWITCH_SPVN220100	SM SW DETECTOR SPST-NO 5V 1MA	~	~

Item	Side	Grid ref.		Description and Value			
T7500	BTM	N	6	TRANS_LDB15	TRANSF BALUN 2134 +-90MHZ 0805	~	~
T7501	BTM	L	6	TRANS_LDB15	TRANSF BALUN 3800 +-550MHZ 0805	~	~
T7502	BTM	P	3	TRANS_LDB15	TRANSF BALUN 1800 +-100mhz 2x1.25	~	~
T7503	BTM	M	9	TRANS_LDB15	TRANSF BALUN 3800 +-550MHZ 0805	~	~
V2000	BTM	B	8	CASE_457	TVS DI 1PMT16AT3 16V 175W PWRMITE	~	~
V2001	BTM	D	4	SC_75A	MFET 2SK3019 N 30V 0.1A 7R SC-75A	~	~
V2300	Top	D	8	EM3	TR DTC143ZE N RBE4K7/47K 0A1 SC75	~	~
V4400	Top	U	4	PT202MR0MP	DI PHOTO PT202MR0MP 620NM 1.25X2	~	~
V7500	BTM	O	9	SOT_563	SCHDIX2 RF DETECTOR CT 1PF 0V39 SOT666	~	~

Item	Side	Grid ref.		Description and Value			
X1470	BTM	P	6	SOCKET_DMD10413	CAMERA MOD.SOCKET 2X7POL SPR P1.4	~	~
X2001	BTM	A	6	SYSCON_MQ202_NK_14R3	SM SYSTEM CONNECTOR 14POL	~	~
X2060	Top	N	11	TRACEABILITY_PAD	MODULE ID COMPONENT 2.8X1.8X0.3	~	~
X2070	BTM	C	8	LYNX_BATT_CONN	SM LYNX BATT.CONN 3POL 12V 2A H7	~	~
X2700	BTM	F	8	SIM_READER_M_C707_10M006_532_2	SM SIM CONN 2X3POL P2.54 15V 0.5A	~	~
X4400	Top	F	2	SMK_4309_B_B_16P_V8	SM CONN 16P SPR P1.3 50V PWB/PWB	~	~
X4401	Top	T	3	JST_R_JAVK_G_1_R3	SM CONN 2X12F P0.4 30V 0.3A PCB/PCB	~	~
X4402	Top	R	9	FORK_SPRING_040_000443_RM_1	FORK SPRING 040-000443 RM-1	~	~
X4403	Top	J	9	FORK_SPRING_040_000443_RM_1	FORK SPRING 040-000443 RM-1	~	~
X4404	Top	R	4	FORK_SPRING_040_000443_RM_1	FORK SPRING 040-000443 RM-1	~	~
X4405	Top	J	4	FORK_SPRING_040_000443_RM_1	FORK SPRING 040-000443 RM-1	~	~

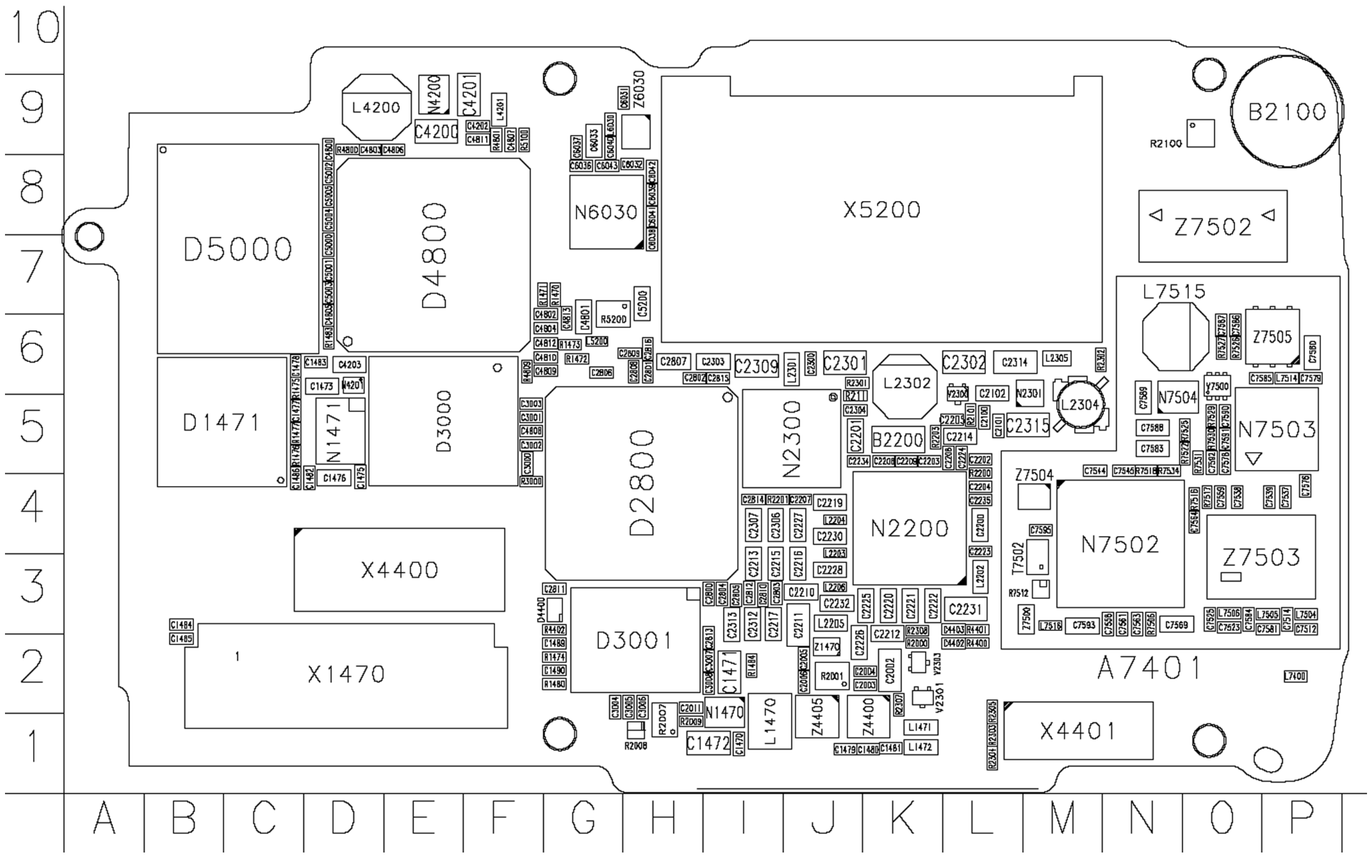
Item	Side	Grid ref.		Description and Value			
X5200	BTM	L	3	MOLEX_MMC_P03_3D0545_001	CONN SMC RS-MMC 6POL P2.5	~	~
Z2000	BTM	B	7	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
Z2001	BTM	B	7	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
Z2003	BTM	B	7	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
Z4400	Top	H	3	uBGA25_2.69X2.69	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z4401	Top	G	1	FC6_1.65X1.15	ASIP 2-CH MIC EMI/ ESD **PB-FREE**	~	~
Z4402	Top	H	9	uBGA25_2.69X2.69	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z4403	Top	H	10	uBGA25_2.69X2.69	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z6030	BTM	F	1	EZFVQ42NM61S	LTCC FILT 2441.75 +-41.75MHZ 2.5X2	2441.75MHz	~
Z7500	BTM	P	4	FERRITE_FBMJ1608	FERRITE BEAD 0R01 28R/ 100MHZ 0603	28R/ 100MHz	~

Item	Side	Grid ref.		Description and Value			
Z7501	BTM	N	6	FILTER_SAW_2.1X1.7_H0.8	SAW FILTER 2140 +-30MHZ 2.0X1.6X1.0	2140MHz	~
Z7502	BTM	Q	9	DFYK61G95LBJCB	DUPL 1920-1980/2110-2170MHZ 9X4.3	1920-1980/2110-2170MHz	~
Z7503	BTM	S	3	ANT_SW_M043B	ANT.SW +3SAW 880-960/1710-1990 MHZ	~	~
Z7504	BTM	P	3	FILTER_SAW_2.1X1.7_H0.8	SAW FILTER 897.5 +-17.5MHZ 2.0X1.6	897.5MHz	~
Z7505	BTM	P	10	ISOLATOR_CEZ0047	ISOLATOR 1950 +-30MHZ 13DB 3.3X3.4X1.6	~	~
Z7506	BTM	J	6	FILTER_SAW_2.1X1.7_H0.8	SAW FILTER 1950 +-30MHZ 2.0X1.6X1.0	1950MHz	~

Note: For Nokia product codes, please refer to the latest Service Bulletins on the Partner Website (PWS).
To ensure you are always using the latest codes, please check the PWS on a daily basis.

Component layouts

RM-42 component layout - top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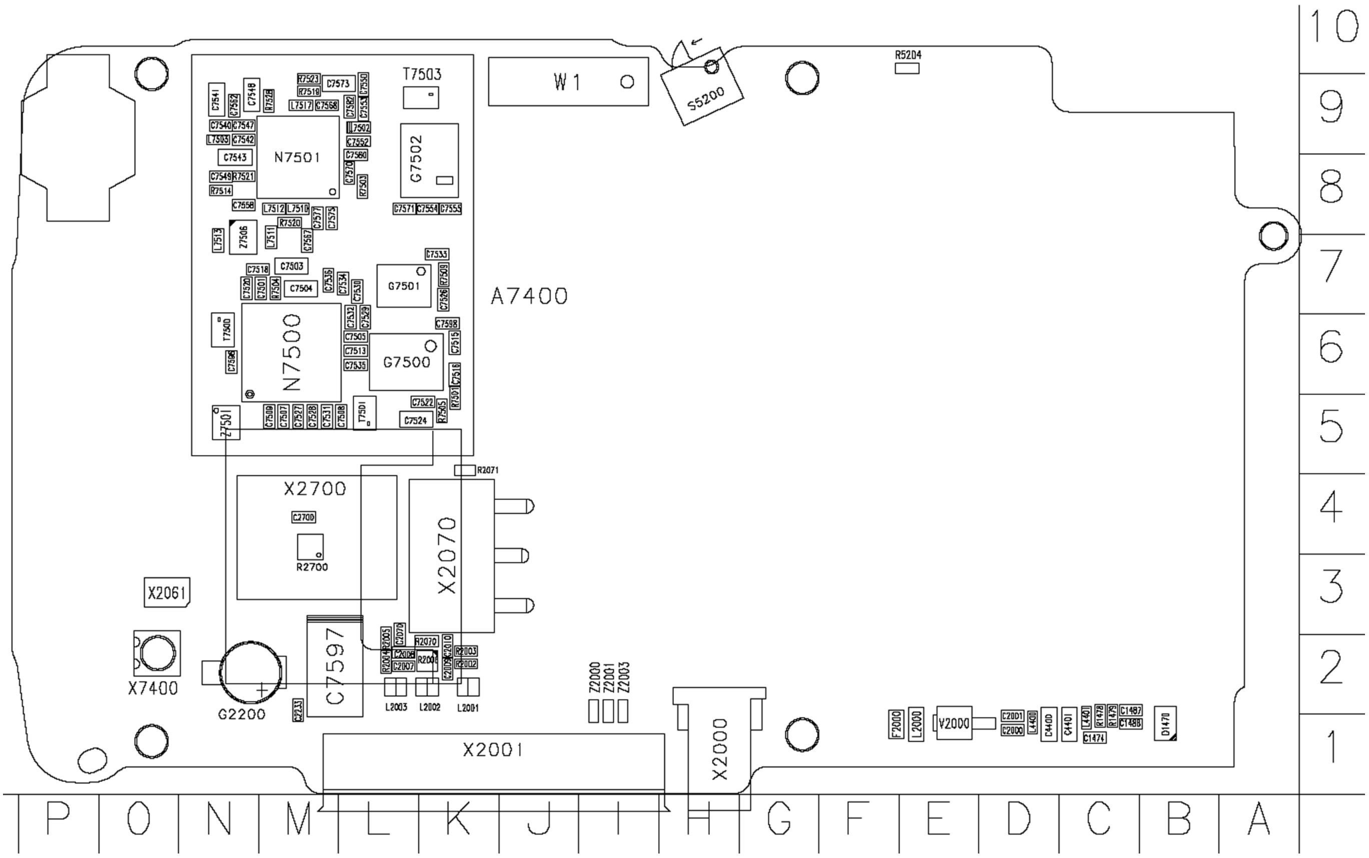
RM-42 component layout - bottom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3 — Service Software Instructions

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Phoenix installation steps in brief

Before you begin

Recommended hardware requirements:

- Computer processor: Pentium 700 MHz or higher
- RAM 256 MB
- Disk space 100-300 MB

Supported operating systems:

- *Windows 2000* Service Pack 3 or higher
- *Windows XP* Service Pack 1 or higher

Context

Phoenix is a service software for reprogramming, testing and tuning phones.

Phoenix installation contains:

- Service software support for all phone models included in the package
- Flash update package files for programming devices
- All needed drivers for:
  - PKD-1 (DK2) dongle
  - DKU-2 USB cable

Note: Separate installation packages for flash update files and drivers are also available, but it is not necessary to use them unless there are updates between *Phoenix* service software releases. If separate update packages are used, they should be used after *Phoenix* and data packages have been installed.

The phone model specific data package includes all changing product specific data:

- Product software binary files
- Files for type label printing
- Validation file for the faultlog repair data reporting system
- All product specific configuration files for *Phoenix* software components

Note: *Phoenix* and phone data packages should only be used as complete installation packages. Uninstallation should be made from the *Windows* Control Panel.

To use *Phoenix*, you need to:

Steps

1. Connect a PKD-1 (DK2) dongle to the computer parallel port.
2. Install *Phoenix*.
3. Install the phone-specific data package.
4. Configure users.
5. Manage connection settings (depends on the tools you are using).

If you use FPS-8:	• Update FPS-8 software • Activate FPS-8

If you use FPS-10:	- Update FPS-10 software **Note:** There is no need to activate FPS-10. - Activate SX-4 smart card, if you need tuning and testing functions. **Note:** When FPS-10 is used only for product software updates, SX-4 smart card is not needed.

Results

Phoenix is ready to be used with FPS-8 or FPS-10 flash prommers and other service tools.

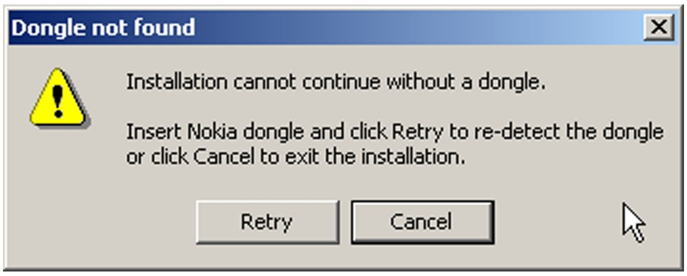
Installing *Phoenix*

Before you begin

- Check that a dongle is attached to the parallel port of your computer.
- Download the *Phoenix* installation package (for example, *phoenix_service_sw_2004_39_x_xx.exe*) to your computer (in *C:|TEMP*, for instance).
- Close all other programs.
- Depending on your operating system, administrator rights may be required to install *Phoenix*.
- If uninstalling or rebooting is needed at any point, you will be prompted by the InstallShield program.

Context

At some point during the installation procedure, you may get the following message:


Dongle not found

Installation cannot continue without a dongle.

Insert Nokia dongle and click Retry to re-detect the dongle or click Cancel to exit the installation.

Figure 3 Dongle not found

This may be a result of a defective or too old PKD-1 dongle.

Check the COM/parallel ports used. After correcting the problem, you can restart the installation.

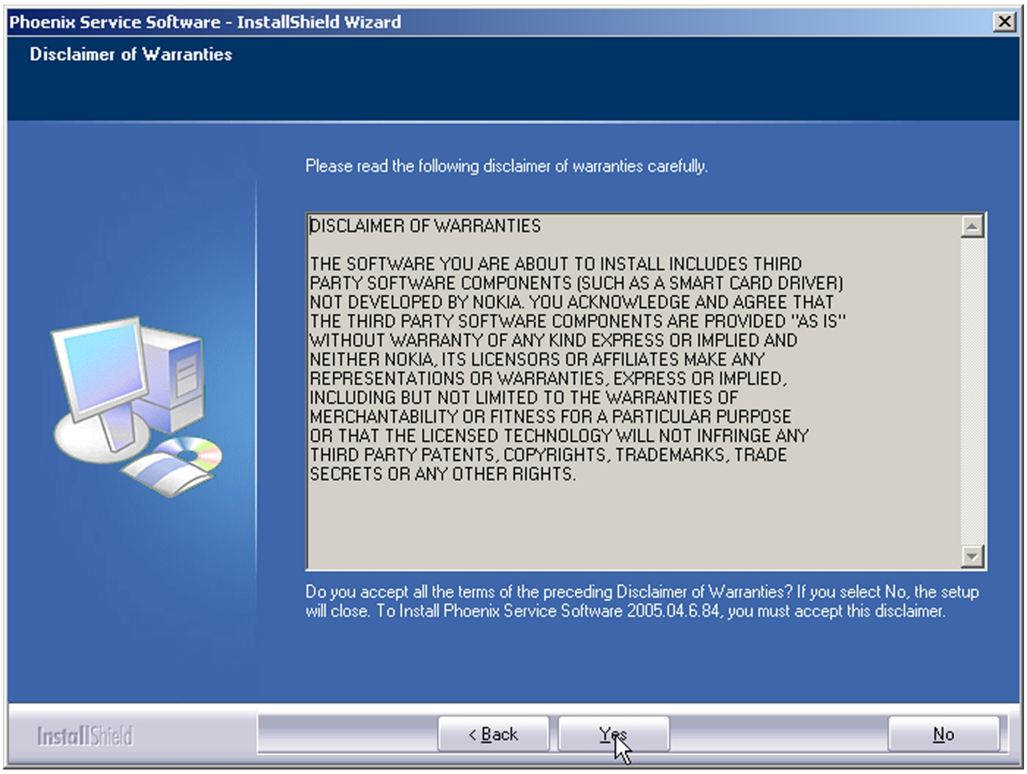
For more detailed information, please refer to *Phoenix* Help files.

> **Tip:** Each feature in *Phoenix* has its own Help function, which can be activated while running the program. Press the **F1** key or the feature's **Help** button to activate a Help file.

Steps

1. To start the installation, run the application file (for example,*phoenix_service_sw_2004_39_x_xx.exe*).
2. In the *Welcome* dialogue, click **Next**.

3. Read the disclaimer text carefully and click **Yes**.



Please read the following disclaimer of warranties carefully.

DISCLAIMER OF WARRANTIES

THE SOFTWARE YOU ARE ABOUT TO INSTALL INCLUDES THIRD PARTY SOFTWARE COMPONENTS (SUCH AS A SMART CARD DRIVER) NOT DEVELOPED BY NOKIA. YOU ACKNOWLEDGE AND AGREE THAT THE THIRD PARTY SOFTWARE COMPONENTS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND EXPRESS OR IMPLIED AND NEITHER NOKIA, ITS LICENSORS OR AFFILIATES MAKE ANY REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR THAT THE LICENSED TECHNOLOGY WILL NOT INFRINGE ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADEMARKS, TRADE SECRETS OR ANY OTHER RIGHTS.

Do you accept all the terms of the preceding Disclaimer of Warranties? If you select No, the setup will close. To Install Phoenix Service Software 2005.04.6.84, you must accept this disclaimer.

Figure 4 Disclaimer text

4. Choose the destination folder.

   The default folder *C:|ProgramFiles|Nokia|Phoenix* is recommended.
5. To continue, click **Next.**

   To choose another location, click **Browse** (not recommended).
6. Wait for the components to be copied.

   The progress of the installation is shown in the *Setup Status* window.
7. Wait for the drivers to be installed and updated.

   The process may take several minutes to complete.

   If the operating system does not require rebooting, the PC components are registered right away.

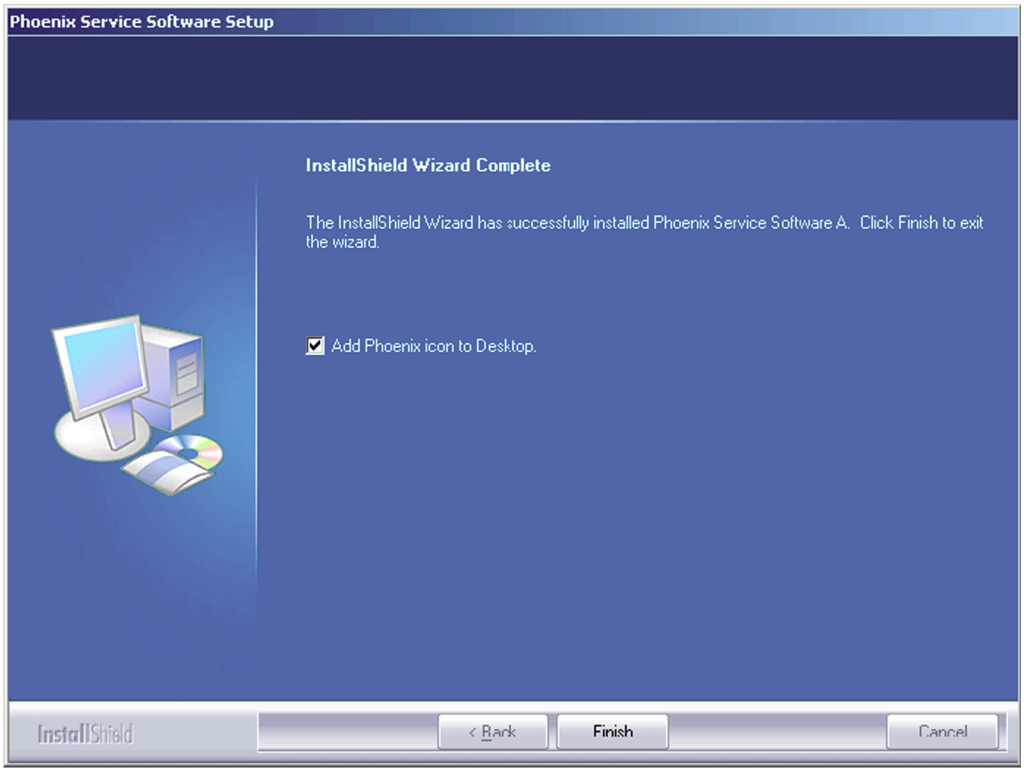
   If the operating system requires restarting your computer, the Install Shield Wizard will notifies about it.

   Select **Yes...** to reboot the PC immediately or **No...** to reboot the PC manually afterwards.

   After the reboot, all components are registered.

   Note: *Phoenix* does not work, if the components have not been registered.

8. To end the installation, click **Finish**.



Phoenix Service Software Setup

InstallShield Wizard Complete

The InstallShield Wizard has successfully installed Phoenix Service Software A. Click Finish to exit the wizard.

☑ Add Phoenix icon to Desktop.

Figure 5 InstallShield Wizard Complete

Next action

After the installation, *Phoenix* can be used after:

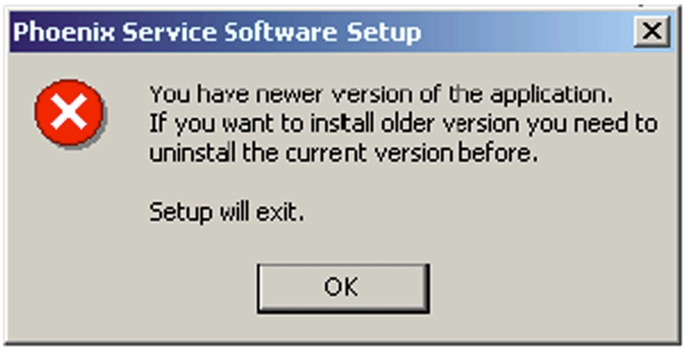
- installing phone model specific data package for *Phoenix*
- configuring users and connections

FPS-8 and FPS-10 flash prommers can be used after updating their flash update package files.

Updating *Phoenix* installation

Context

- If you already have the *Phoenix* service software installed on your computer, you need to update the software when new versions are released.
- To update *Phoenix*, you need to follow the same steps as when installing it for the first time.
- When you are updating, for example, from version **a14_2004_16_4_47** to **a15_2004_24_7_55**, the update will take place automatically without uninstallation.
- Always use the latest available versions of both *Phoenix* and the phone-specific data package. Instructions can be found in the phone model specific Technical Bulletins and phone data package *readme.txt* files (shown during installation).
- If you try to update *Phoenix* with the same version you already have (for example, **a15_2004_24_7_55** to **a15_2004_24_7_55**), you are asked if you want to uninstall the existing version. In this case you can choose between a total uninstallation or a repair installation in a similar way when choosing to uninstall the application from the *Windows* Control Panel.
- If you try to install an older version (for example, downgrade from **a15_2004_24_7_55** to **a14_2004_16_4_47**), installation will be interrupted.



You have newer version of the application.
If you want to install older version you need to uninstall the current version before.

Setup will exit.

Figure 6 Installation interrupted

- Always follow the instructions on the screen.

Steps

1. Download the installation package to your computer hard disk.
2. Close all other programs.
3. Run the application file (for example, *phoenix_service_sw_2004_39_x_xx.exe*).

Results

A new *Phoenix* version is installed and driver versions are checked and updated.

Uninstalling *Phoenix*

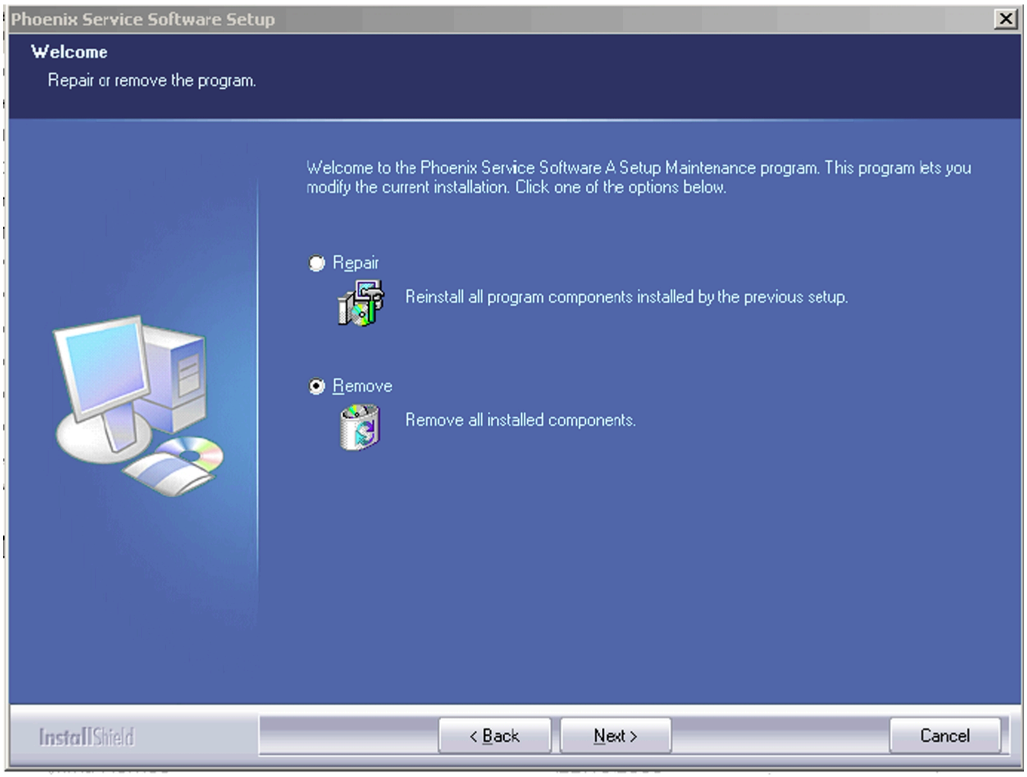
Context

You can uninstall *Phoenix* service software manually from the *Windows* Control Panel.

Steps

1. Open the **Windows Control Panel**, and choose **Add/Remove Programs**.

2. To uninstall *Phoenix*, choose **Phoenix Service Software→Change/Remove→Remove** .



Phoenix Service Software Setup

Welcome

Repair or remove the program.

Welcome to the Phoenix Service Software A Setup Maintenance program. This program lets you modify the current installation. Click one of the options below.

○ Repair

Reinstall all program components installed by the previous setup.

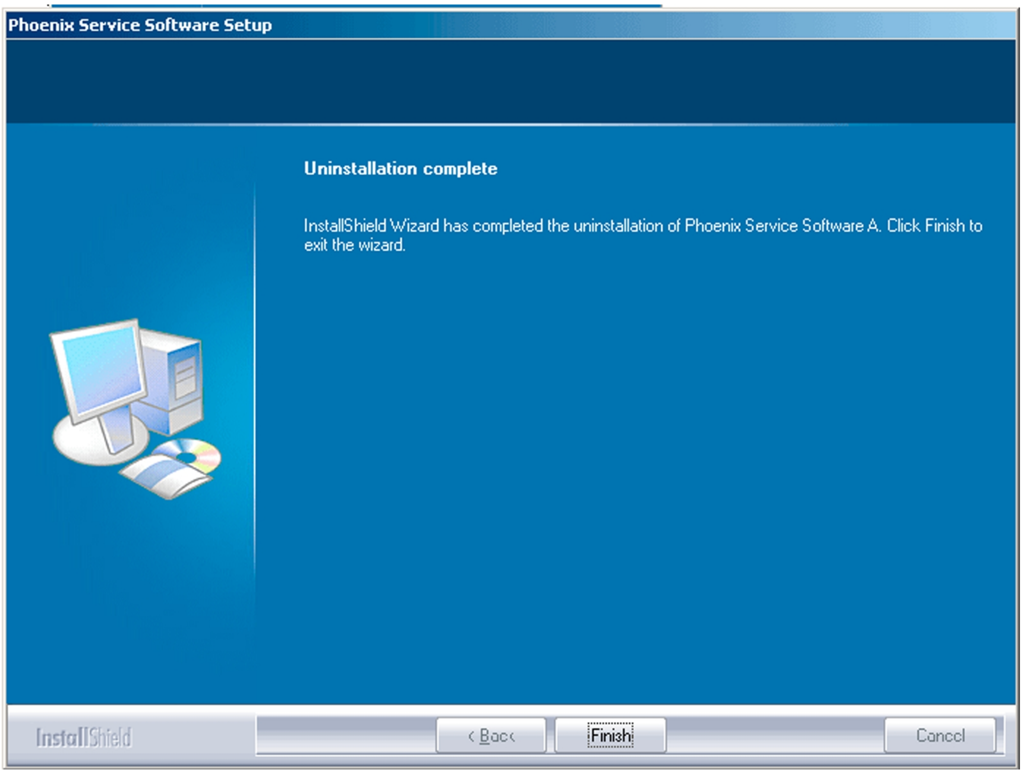
● Remove

Remove all installed components.

Figure 7 Remove program

The progress of the uninstallation is shown.

3. If the operating system does not require rebooting, click **Finish** to complete.



Phoenix Service Software Setup

Uninstallation complete

InstallShield Wizard has completed the uninstallation of Phoenix Service Software A. Click Finish to exit the wizard.

Figure 8 Finish uninstallation

If the operating system requires rebooting, InstallShield Wizard will notify you. Select **Yes...** to reboot the PC immediately and **No...** to reboot the PC manually afterwards.

Repairing *Phoenix* installation

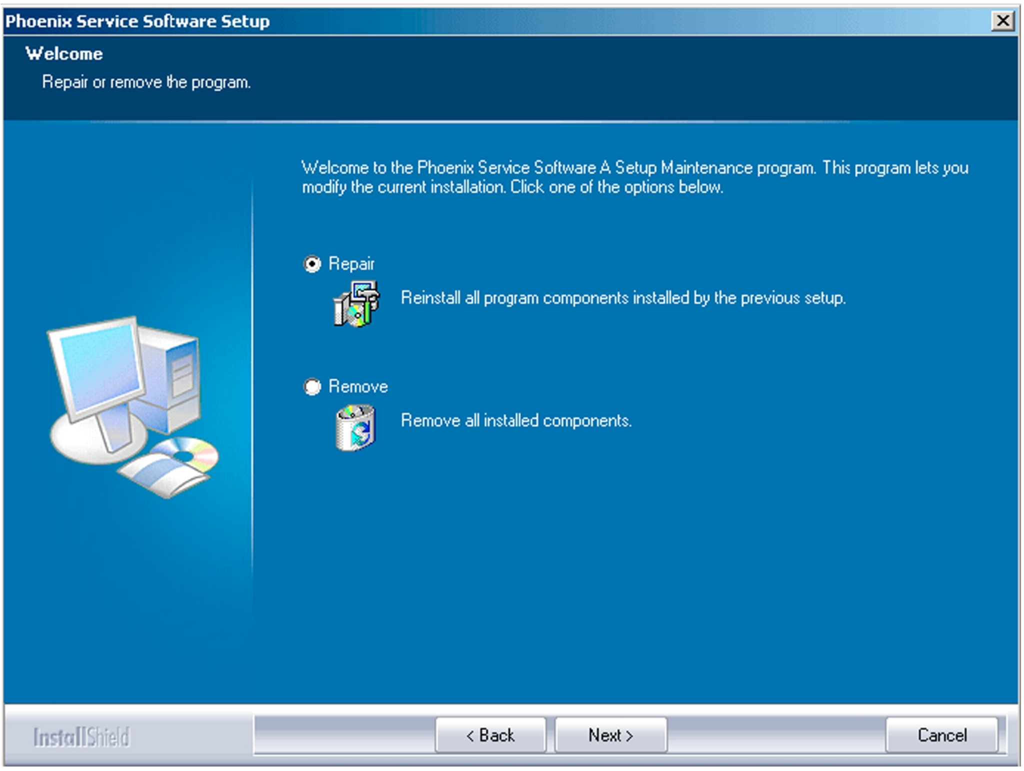
Context

If you experience any problems with the service software or suspect that files have been lost, use the repair function before completely reinstalling *Phoenix*.

> **Note:** The original installation package (for example, *phoenix_service_sw_a15_2004_24_7_55.exe*) must be found on your PC when you run the repair setup.

Steps

1. Open **Windows Control Panel→Add/Remove Programs** .
2. Choose **Phoenix Service Software→Change/Remove** .
3. In the following view, select **Repair**.



Welcome to the Phoenix Service Software A Setup Maintenance program. This program lets you modify the current installation. Click one of the options below.

● Repair
Reinstall all program components installed by the previous setup.

○ Remove
Remove all installed components.

Figure 9 Repair program

Phoenix reinstalls components and registers them.

The procedure is the same as when updating *Phoenix*.

4. To complete the repair, click **Finish**.

Phone data package overview

Each product has its own data package (DP). The product data package contains all product-specific data files to make the Phoenix service software and tools usable with a certain phone model.

The phone data package contains the following:

- Product software binary files

- Files for type label printing
- Validation file for the fault log repair data reporting system
- All product-specific configuration files for Phoenix software components

Data files are stored in **C:\Program Files\Nokia\Phoenix** (default).

Installing phone data package

Before you begin

- A phone-specific data package contains all data required for the *Phoenix* service software and service tools to be used with a certain phone model.
- Check that a dongle is attached to the parallel port of your computer.
- Install *Phoenix* service software.
- Download the installation package (for example, *XX-XX_dp_EA_v_1_0.exe*) to your computer (for example, in C:\TEMP).
- Close all other programs.

(XX-XX = type designator of the product)

If you already have *Phoenix* installed on your computer, you will need to update it when a new version is released.

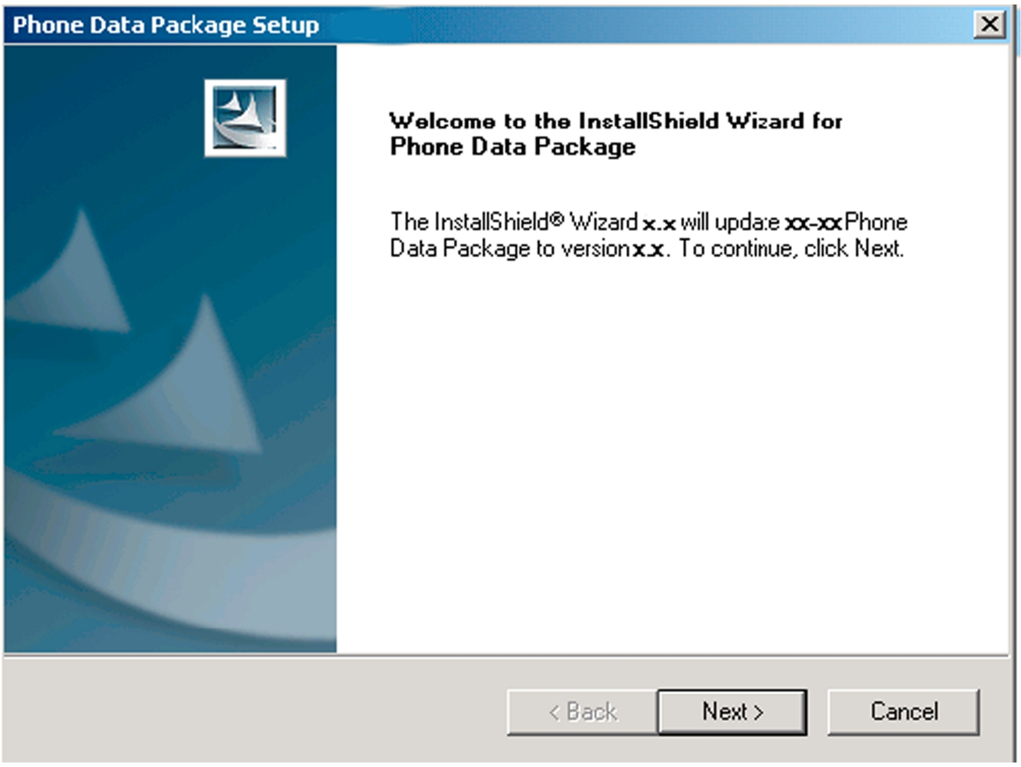
> **Note:** Often *Phoenix* and the phone-specific data package come in pairs, meaning that a certain version of *Phoenix* can only be used with a certain version of a data package. Always use the latest available versions of both. Instructions can be found in phone-specific Technical Bulletins and *readme.txt* files of data packages.

Steps

1. To start the installation, run the application file (for example, *XX-XX_dp_EA_ v_1_0.exe*),

   Wait for the installation files to be extracted.

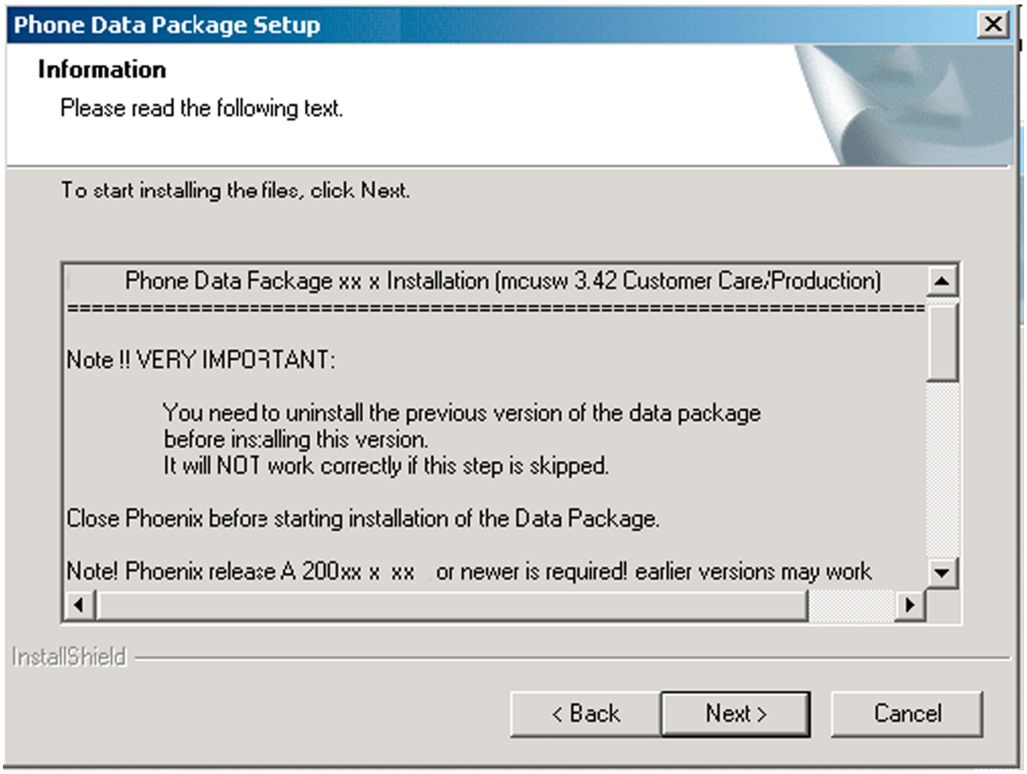
2. Click **Next**.



Welcome to the InstallShield Wizard for Phone Data Package

The InstallShield® Wizard x.x will update xx-xx Phone Data Package to version x.x. To continue, click Next.

3. In the following view you can see the contents of the data package. Read the text carefully. There is information about the *Phoenix* version required with this data package.



Information

Please read the following text.

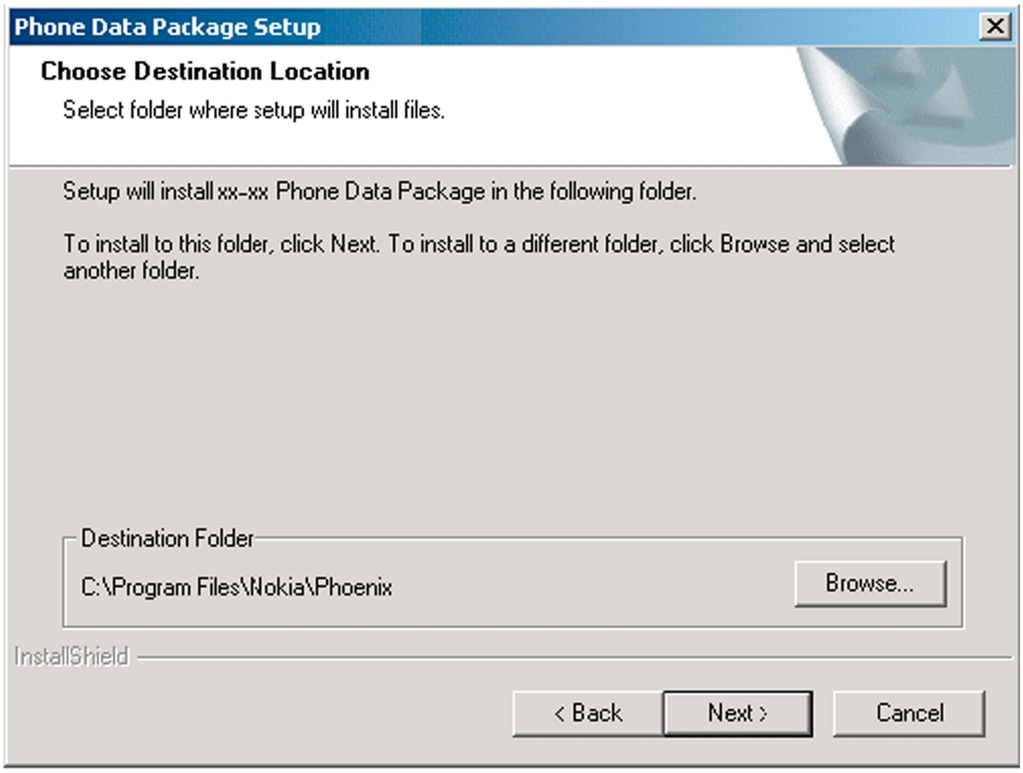
To start installing the files, click Next.

```
        Phone Data Package xx x Installation (mcusw 3.42 Customer Care/Production)
=======================================================================

Note !! VERY IMPORTANT:

        You need to uninstall the previous version of the data package
        before installing this version.
        It will NOT work correctly if this step is skipped.

Close Phoenix before starting installation of the Data Package.

Note! Phoenix release A 200xx x  xx   or newer is required! earlier versions may work
```

Figure 10 Data package setup information

4. To continue, click **Next**.

5. Choose the destination folder, and click **Next** to continue.



Phone Data Package Setup

Choose Destination Location

Select folder where setup will install files.

Setup will install xx-xx Phone Data Package in the following folder.

To install to this folder, click Next. To install to a different folder, click Browse and select another folder.

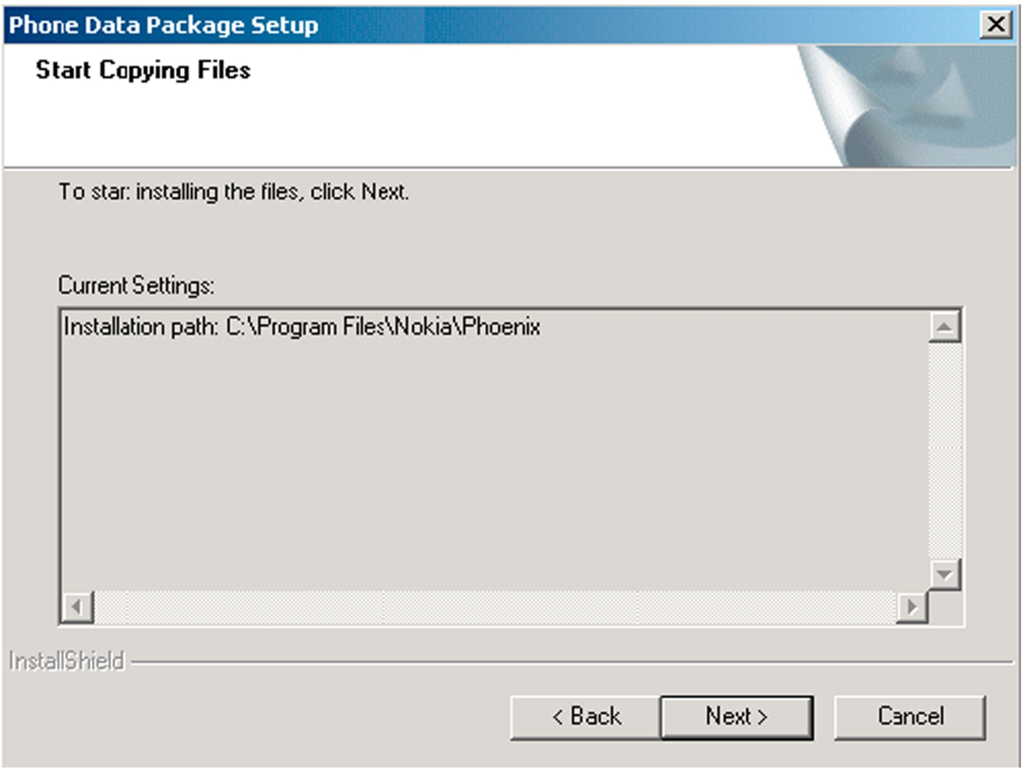
Destination Folder

C:\Program Files\Nokia\Phoenix

Figure 11 Data package destination folder

The InstallShield Wizard checks where *Phoenix* is installed, and the directory is shown.

6. To start copying the files, click **Next**.



Phone Data Package Setup

Start Copying Files

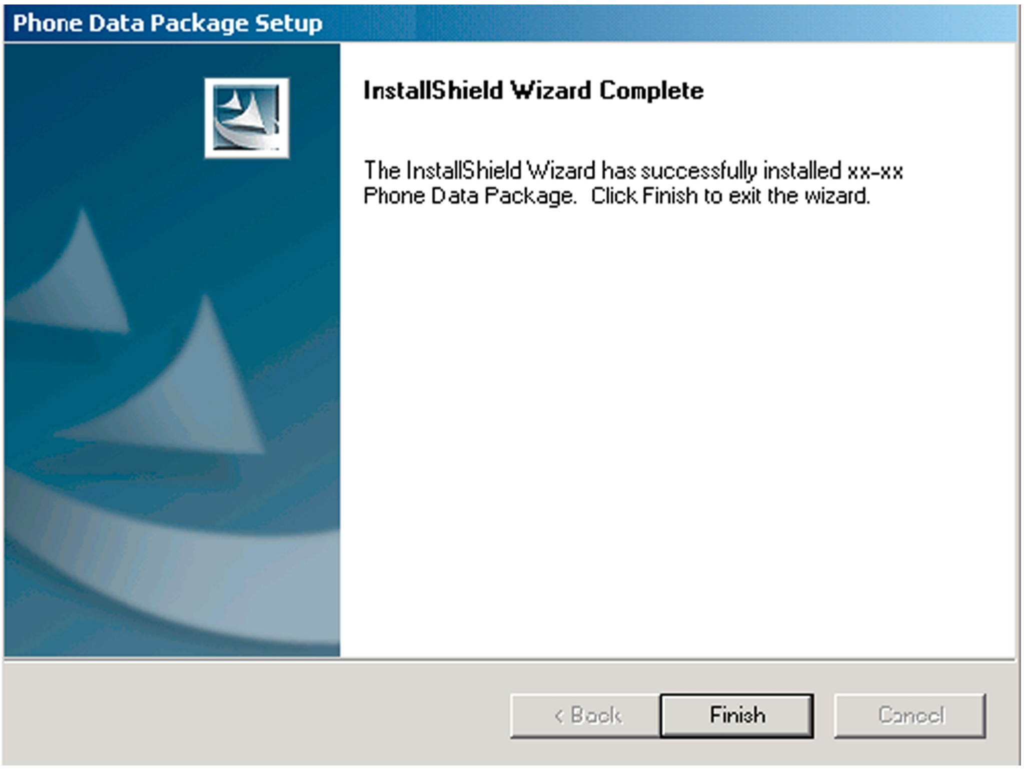
To star: installing the files, click Next.

Current Settings:

Installation path: C:\Program Files\Nokia\Phoenix

Phone model specific files are installed. Please wait.

7. To complete the installation, click **Finish**.



Phone Data Package Setup

InstallShield Wizard Complete

The InstallShield Wizard has successfully installed xx-xx Phone Data Package. Click Finish to exit the wizard.

Figure 12 InstallShield Wizard Complete

Next action

Phoenix can be used for flashing phones and printing type labels after:

- Configuring users
- Managing connections

FPS-8 and FPS-10 can be used after updating their flash update package files.

Uninstalling phone data package

Context

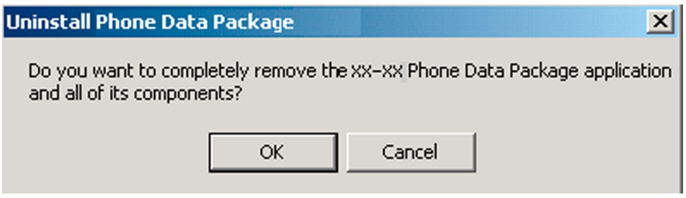
There is no need to uninstall an older version of a data package, unless instructions to do so are given in the *readme.txt* file of the data package and bulletins related to the release.

Please read all related documents carefully.

Steps

1. Locate the data package installation file (e.g. *XX-XX_dp_EA_v_1_0.exe*) from your computer.
2. To start the uninstallation procedure, double-click the data package installation file.

3. To uninstall the data package, click **OK** or to interrupt the uninstallation, click **Cancel**.



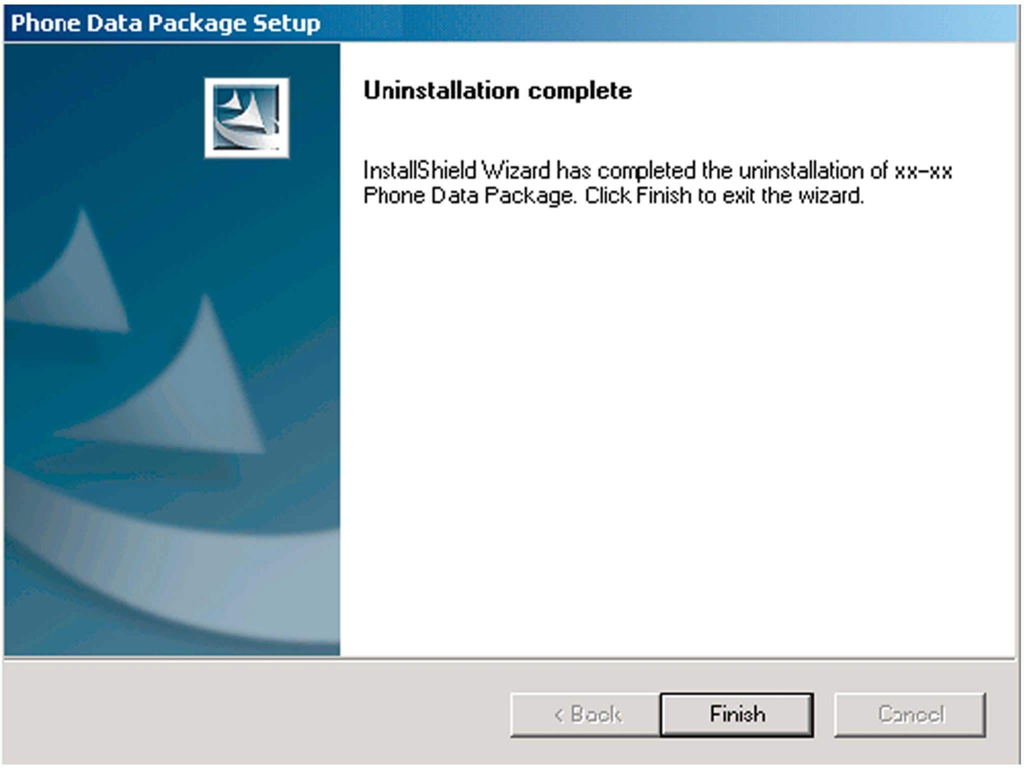
Uninstall Phone Data Package

Do you want to completely remove the xx-xx Phone Data Package application and all of its components?

OK
Cancel

Figure 13 Uninstalling phone data package

4. When the data package is uninstalled, click **Finish**.



Phone Data Package Setup

Uninstallation complete

InstallShield Wizard has completed the uninstallation of xx-xx Phone Data Package. Click Finish to exit the wizard.

< Back
Finish
Cancel

Figure 14 Finishing data package uninstallation

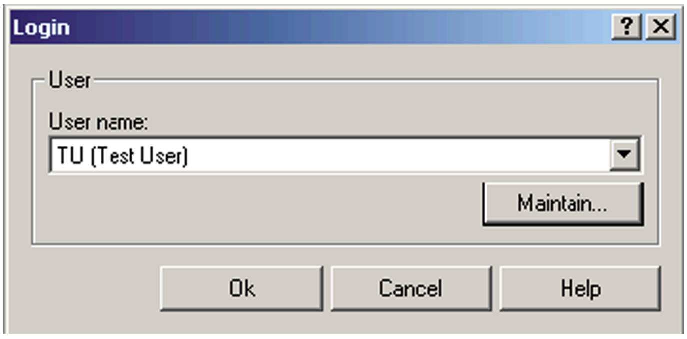
Alternative steps

- You can also uninstall the data package manually from **Control Panel→Add/Remove Programs→xx-xx* Phone Data Package** . (*= type designator of the phone).

Configuring users in *Phoenix*

Steps

1. Start *Phoenix* service software, and log in.



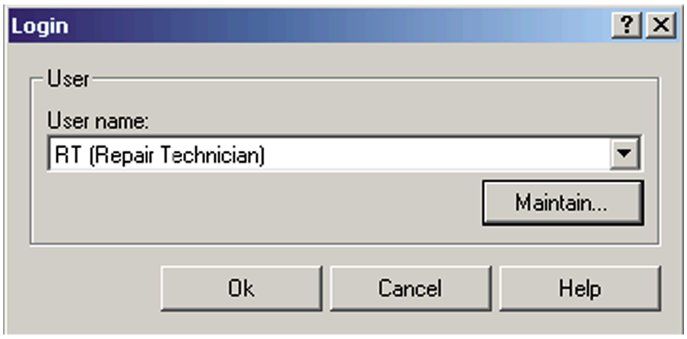
User name: TU (Test User)

Figure 15 Phoenix login

If the user ID is already configured, select s/he from the *User name* drop-down list, and click **OK**.

2. To add a new user, or to edit existing ones, click **Maintain**.
3. To add a new user, click **New**.
4. Type in the name and initials of the user, and click **OK**.

   The user is added to the user name list.
5. Select the desired user from the *User name* drop-down list, and click **OK**.



User name: RT (Repair Technician)

Figure 16 New user configured

Managing connections in *Phoenix*

Context

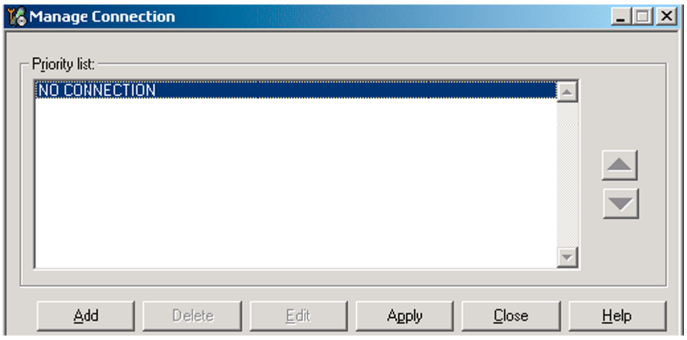
With the **Manage Connections** feature you can edit and delete existing connections or create new ones.

> **Note:** After choosing the desired connection, and connecting the phone to a PC for the first time, allow the PC to install the USB device drivers first. Please note that this may take some time to complete.
>
> If there are problems after the driver installation, check that the USB connection is active from the **Windows Control Panel**. If the problem persists, contact the local PC support.

Steps

1. Start *Phoenix*, and log in.
2. Choose **File→Manage Connections...** .

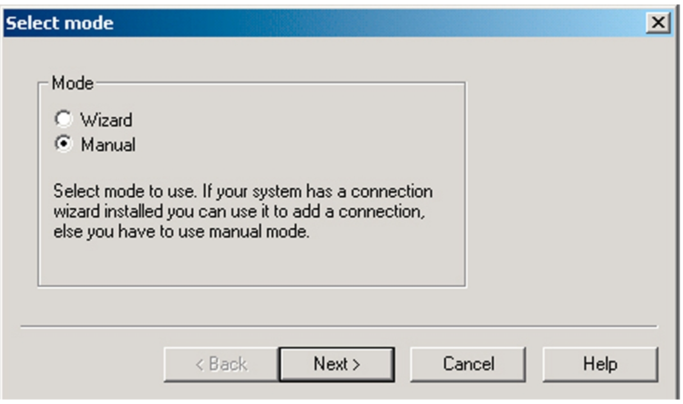
3. To add a new connection, click **Add**.



NO CONNECTION

4. Select **Manual** mode, and click **Next** to continue.

   If you want to create the connection using the Connection Wizard, connect the tools and a phone to your PC. The wizard will automatically try to configure the correct connection.



○ Wizard
● Manual

Select mode to use. If your system has a connection wizard installed you can use it to add a connection, else you have to use manual mode.

Figure 17 Select mode: Manual

i For an FPS-10 flash prommer with a **USB Connection**, choose the following connection settings:

- Media: **FPS-10 USB**
- DEVICE_INDEX: **0**
- SERIAL_NUM: See Serial No from the label attached to the bottom of FPS-10
- ACTIVE_MEDIA: **USB**

ii For an FPS-10 flash prommer with a **LAN connection**, choose the following connection settings:

- Media: **FPS-10 TCP/IP**
- NET_SERV_NAME: Click **Scan...**. Choose your own FPS-10 device based on the correct MAC address. See Serial No from the label attached to the bottom of your FPS-10.
- PORT_NUM: Use the default value, and click **Next**.
- PROTOCOL_FAMILY: Use the default value, and click **Next**.
- SOCKET TYPE: Use the default value, and click **Next**.
- TX_BUFFER_SIZE: Use the default value, and click **Next**.
- RX_BUFFER_SIZE: Use the default value, and click **Next**.

iii For an FPS-8 flash prommer, choose the following connection settings:

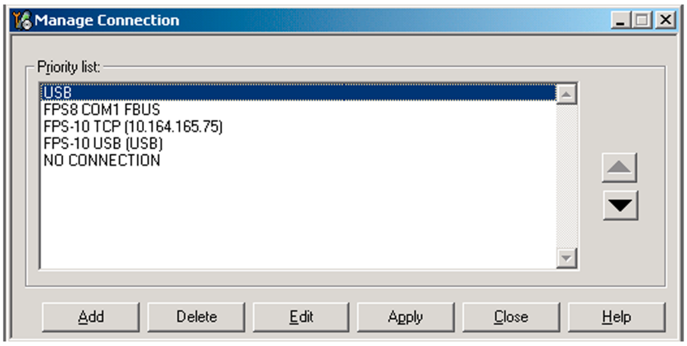
- Media: FPS-8
- PORT_NUM: COM Port where FPS-8 is connected
- COMBOX_DEF_MEDIA: **FBUS**

iv For a plain **USB connection**, choose the following connection settings:

Note: First connect the DKU-2 USB cable between the PC USB port and phone.

- Media: USB

5. To complete the configuration, click **Finish**.
6. Click the connection you want to activate. Use the up/down arrows located on the right hand side to move it on top of the list, then click **Apply**.



USB
FPS8 COM1 FBUS
FPS-10 TCP (10.164.165.75)
FPS-10 USB (USB)
NO CONNECTION

Figure 18 Connections list

The connection is activated, and it can be used after closing the *Manage Connection* window.

The connection information is shown at the right hand bottom corner of the screen.

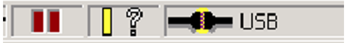
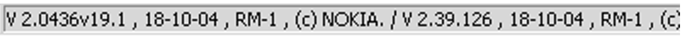


Figure 19 Connection information

7. To use the connection, connect the phone to your PC with correct service tools. Make sure the phone is switched on, and then choose **File→Scan Product** .

Results

The product support module information appears in the status bar:



V 2.0436v19.1 , 18-10-04 , RM-1 , (c) NOKIA. / V 2.39.126 , 18-10-04 , RM-1 , (c)

Figure 20 Product support module information (example from RM-1)

Installing flash support files for FPS-8 and FPS-10

Before you begin

- Install *Phoenix* service software.
- Install phone model specific data package for *Phoenix*.
- If you want to update the flash support files, they are delivered in the same installation package with *Phoenix* or newer *Phoenix* packages beginning from December 2004.

  In case you want to update the MCU files, install the latest data package (see Technical Bulletins for information on the latest one).

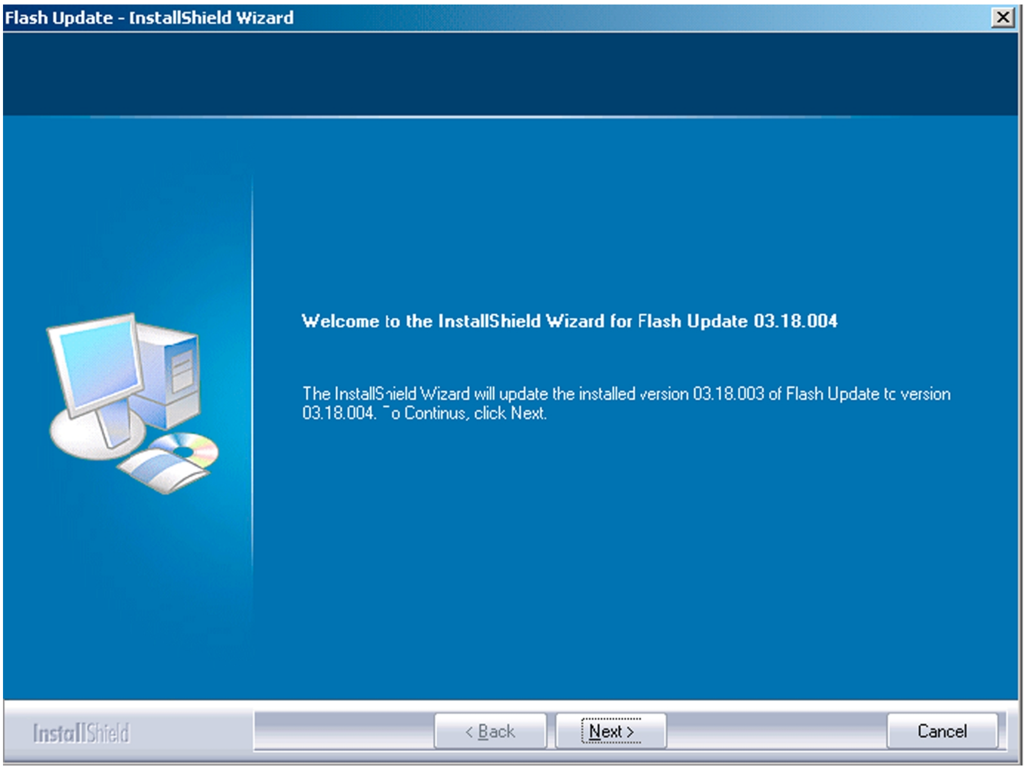
  Normally, it is enough to install *Phoenix* and the phone-specific data package because the installation always includes the latest flash update package files for FPS-8 and FPS-10.
- A separate installation package for flash support files is available. The files can be updated according to these instructions, if updates appear between *Phoenix* data package releases.

Context

If you are not using a separate installation package, you can skip this section and continue with "Updating FPS-8 and FPS-10 flash prommer software" (page 3–22) after installing a new phone data package.

Steps

1. To begin the installation, double-click the flash update file (for example, *flash_update_03_183_0014.exe*).


Flash Update - InstallShield Wizard

Welcome to the InstallShield Wizard for Flash Update 03.18.004

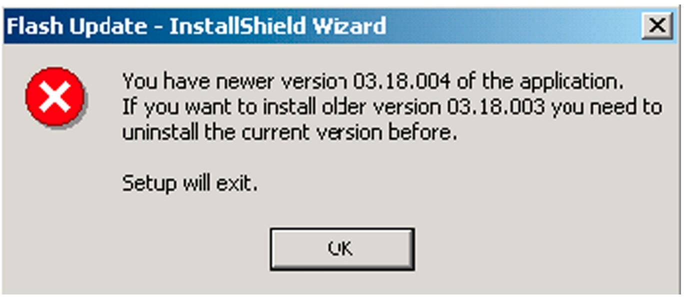
The InstallShield Wizard will update the installed version 03.18.003 of Flash Update to version 03.18.004. To Continue, click Next.

Figure 21 Flash update welcome dialog

If the same version of the flash update package already exists, and you want to reinstall it, the previous package is first uninstalled.

Restart installation again after the uninstallation.

2. If you try to downgrade the existing version to older ones, the setup will be aborted. If there is a need to downgrade the version, uninstall newer files manually from the **Windows Control Panel**, and then rerun the installation.


Flash Update - InstallShield Wizard

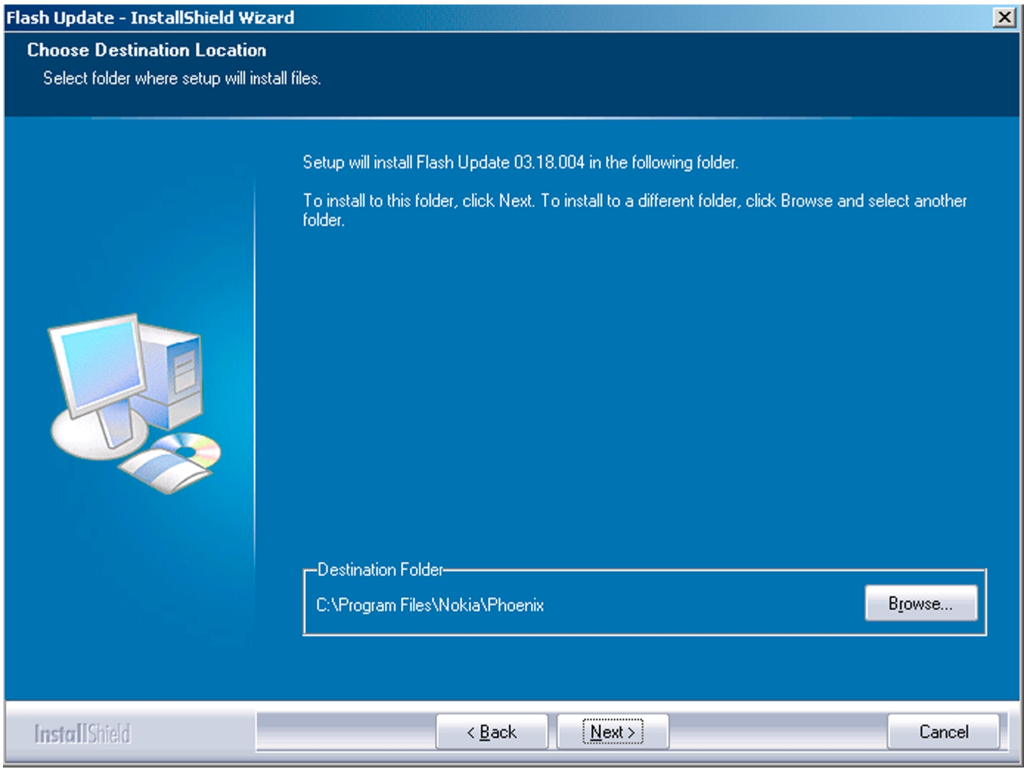
You have newer version 03.18.004 of the application.
If you want to install older version 03.18.003 you need to uninstall the current version before.

Setup will exit.

Figure 22 Flash installation interrupted

If an older version exists on your PC and it needs to be updated, click **Next** to continue installation.

3. It is recommended to install the files to the default destination folder *C:|Program Files|Nokia|Phoenix*. To continue, click **Next**.



Flash Update - InstallShield Wizard

Choose Destination Location

Select folder where setup will install files.

Setup will install Flash Update 03.18.004 in the following folder.

To install to this folder, click Next. To install to a different folder, click Browse and select another folder.

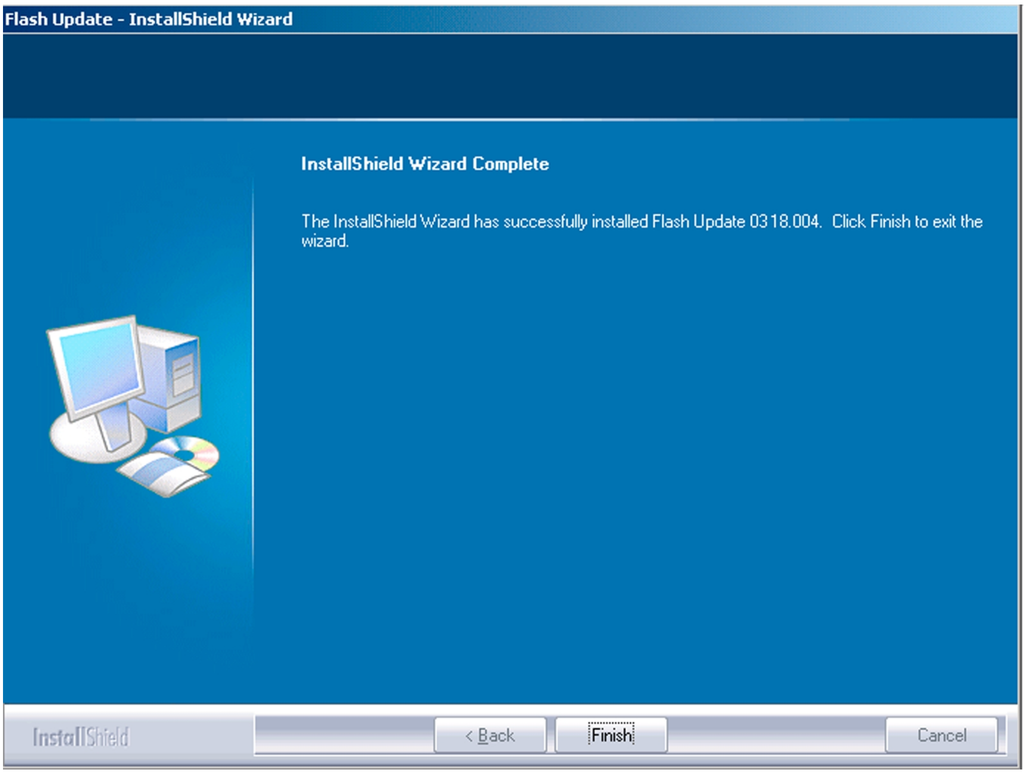
Destination Folder

C:\Program Files\Nokia\Phoenix

Figure 23 Flash destination folder

When installing the flash update files for the first time, you may choose another location by selecting **Browse** (not recommended).

4. To complete the installation procedure, click **Finish** .



Flash Update - InstallShield Wizard

InstallShield Wizard Complete

The InstallShield Wizard has successfully installed Flash Update 0318.004. Click Finish to exit the wizard.

Figure 24 Finish flash update

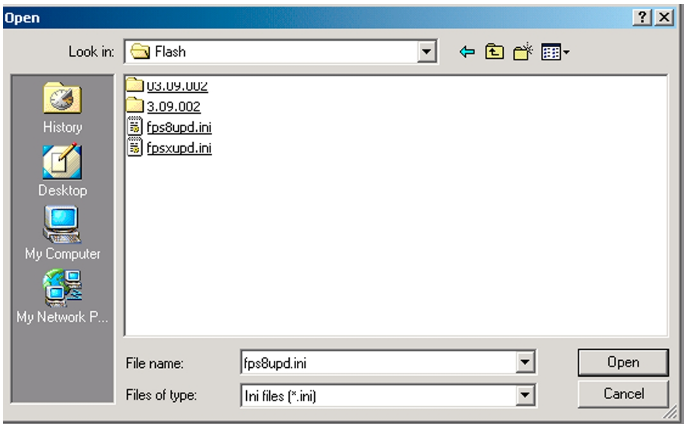
Next action

FPS-8 and FPS-10 flash prommers must be updated using *Phoenix*.

Updating FPS-8 and FPS-10 flash prommer software

Steps

1. Start *Phoenix* service software, and log in.
2. Choose the correct connection for your flash prommer: **File→Manage Connections...**
3. Choose **Flashing→Prommer maintenance** .
4. To update the **FPS-8/FPS-10** software, click **Update**, and select the appropriate file *fps8upd.ini* (for FPS-8) or *fpsxupd.ini* (for FPS-10) from *C:|Program Files|Nokia|Phoenix|Flash*.



Open

Look in: Flash

3.09.002
fps8upd.ini
fpsxupd.ini

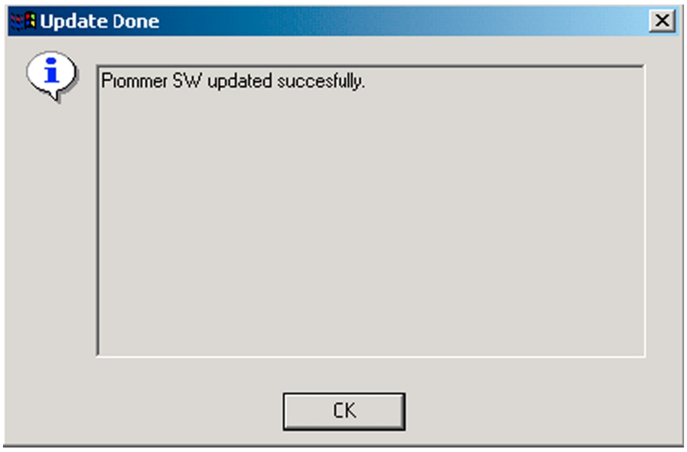
File name: fps8upd.ini

Files of type: Ini files (*.ini)

Figure 25 Flash directory window

Tip: All files can be loaded separately to the prommer used. To do this, click the right mouse button in the *Flash Box Files* pane and select the file type(s) to be loaded.

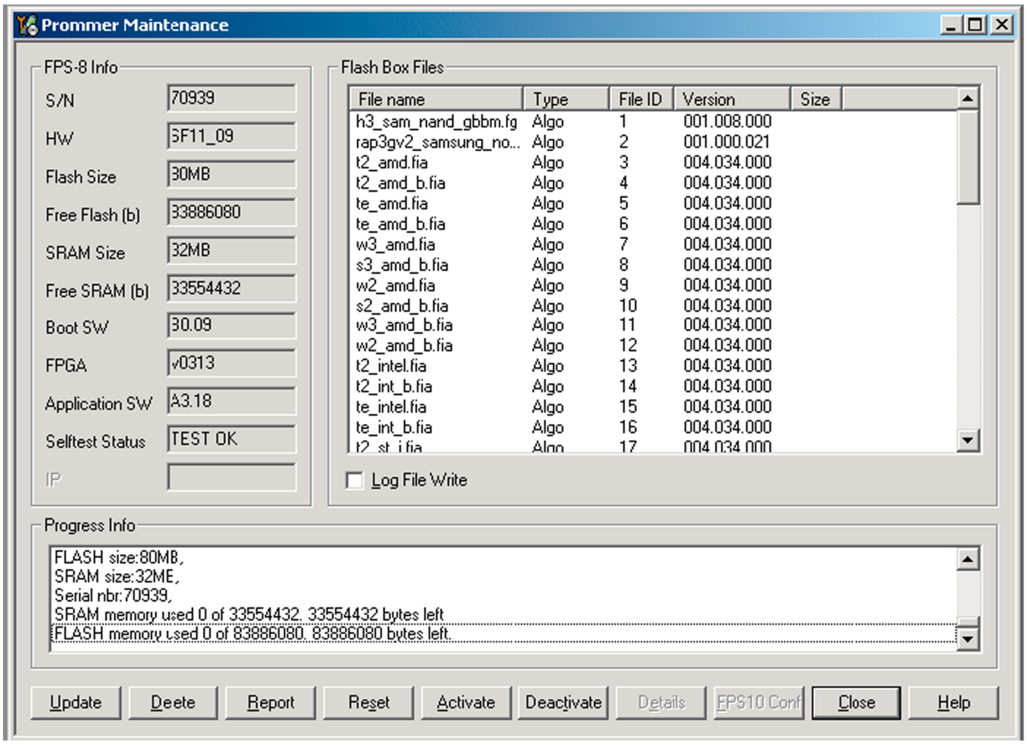
5. Click **OK**.


Update Done

Prommer SW updated succesfully.

Figure 26 Prommer software update finished

6. To close the *Prommer Maintenance* window, click **Close**.


Prommer Maintenance

FPS-8 Info

S/N: 70939
HW: 5F11_09
Flash Size: 80MB
Free Flash (b): 83886080
SRAM Size: 32MB
Free SRAM (b): 33554432
Boot SW: 30.09
FPGA: v0313
Application SW: A3.18
Selftest Status: TEST OK
IP:

Flash Box Files

File name	Type	File ID	Version	Size
h3_sam_nand_gbbm.fg	Algo	1	001.008.000	
rap3gv2_samsung_no...	Algo	2	001.000.021	
t2_amd.fia	Algo	3	004.034.000	
t2_amd_b.fia	Algo	4	004.034.000	
te_amd.fia	Algo	5	004.034.000	
te_amd_b.fia	Algo	6	004.034.000	
w3_amd.fia	Algo	7	004.034.000	
s3_amd_b.fia	Algo	8	004.034.000	
w2_amd.fia	Algo	9	004.034.000	
s2_amd_b.fia	Algo	10	004.034.000	
w3_amd_b.fia	Algo	11	004.034.000	
w2_amd_b.fia	Algo	12	004.034.000	
t2_intel.fia	Algo	13	004.034.000	
t2_int_b.fia	Algo	14	004.034.000	
te_intel.fia	Algo	15	004.034.000	
te_int_b.fia	Algo	16	004.034.000	
t2_st_i.fia	Algo	17	004.034.000	

☐ Log File Write

Progress Info

```
FLASH size:80MB,
SRAM size:32MB,
Serial nbr:70939,
SRAM memory used 0 of 33554432. 33554432 bytes left
FLASH memory used 0 of 83886080. 83886080 bytes left.
```

Figure 27 ***Prommer Maintenance*** **window**

Activating FPS-8

Context

Before FPS-8 can be successfully used for phone programming, it must first be activated.

First fill in the *FPS-8 activation request* sheet in the FPS-8 sales package, and follow the instructions given.

When activation file is received (for example, *00000.in*), copy it to the *C:|ProgramFiles|Nokia|Phoenix |BoxActivation* directory on your computer (this directory is created when *Phoenix* is installed).

Steps

1. Start *Phoenix* service software.
2. Choose **Flashing→Prommer Maintenance** .
3. In the *Prommer Maintenance* window, click **Activate**.
4. To find the activation file, click **Browse**.
5. To activate the prommer, select the activation file and click **Open**.

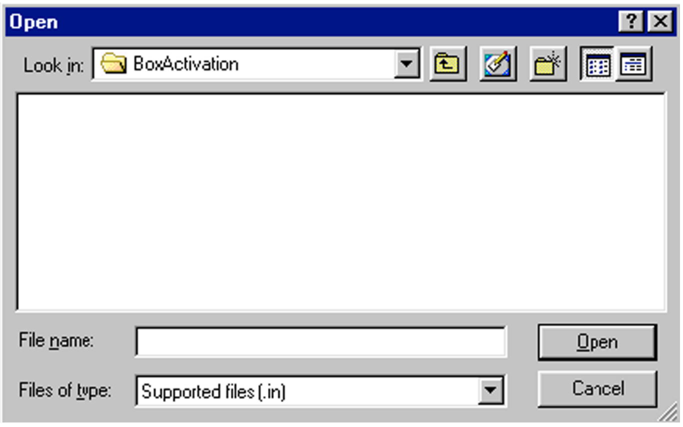

Open
Look in:
BoxActivation
File name:
Files of type:
Supported files (.in)
Open
Cancel

Figure 28 Box activation

6. To complete the activation, restart FPS-8.

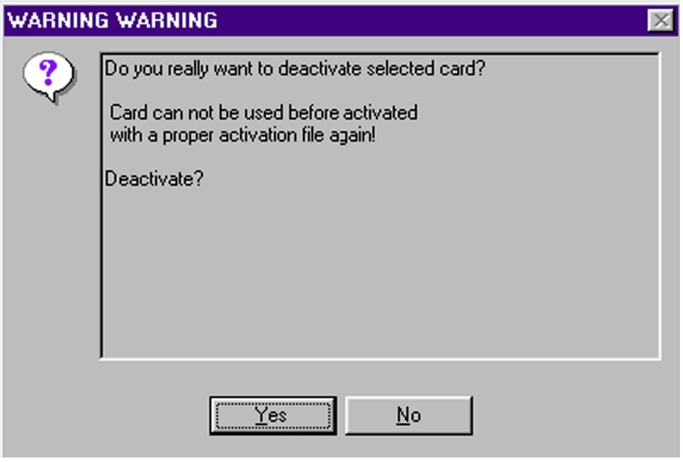
Deactivating FPS-8

Context

If there is, for example, a need to send the FPS-8 box for repair, it must be deactivated first.

Steps

1. Start *Phoenix* service software.
2. Choose **Flashing→Prommer Maintenance** .
3. In the *Prommer Maintenance* window, click **Deactivate**.
4. To confirm the deactivation, click **Yes**.


WARNING WARNING
Yes
No

Do you really want to deactivate selected card?

Card can not be used before activated
with a proper activation file again!

Deactivate?

Figure 29 Deactivation warning

The box is deactivated.

5. To complete the deactivation, restart FPS-8.

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4 — Service Tools and Service Concepts

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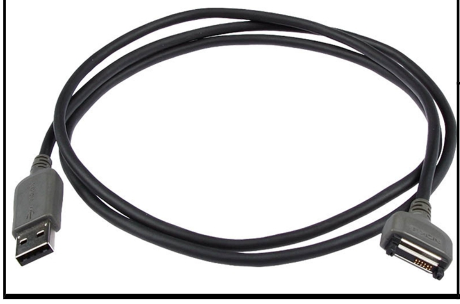
Service tools

The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RM-42, refer to various concepts.

	CA-35S	Power cable	
	CA-35S is a power cable for connecting, for example, the FPS-10 flash prommer to the Point-Of-Sales (POS) flash adapter.		
	CA-53	USB connectivity cable	
	USB to Pop-Port™ connector cable.		

CU-4	Control unit	

CU-4 is a general service tool used with a module jig and/or a flash adapter. It requires an external 12 V power supply.

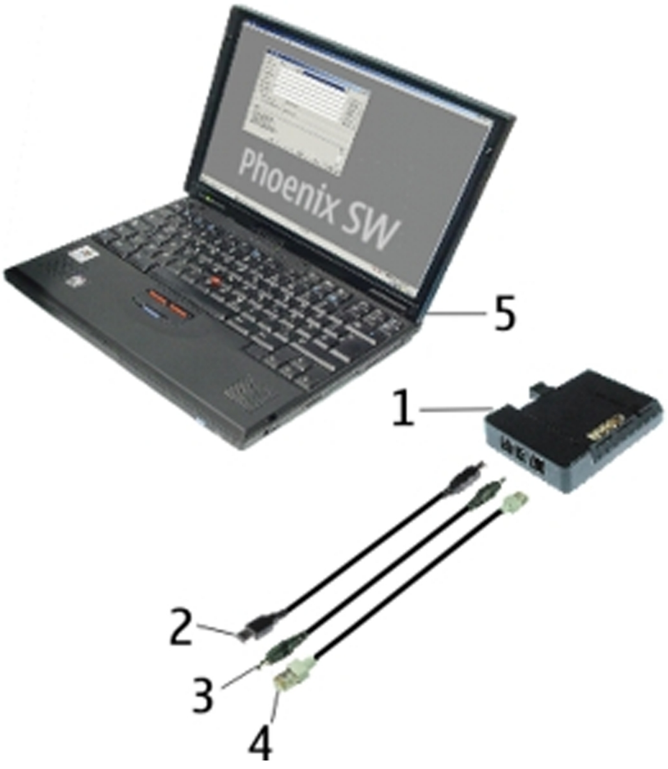
The unit has the following features:

- software controlled via USB
- EM calibration function
- Forwards FBUS/Flashbus traffic to/from terminal
- Forwards USB traffic to/from terminal
- software controlled BSI values
- regulated VBATT voltage
- 2 x USB2.0 connector (Hub)
- FBUS and USB connections supported

When using CU-4, note the special order of connecting cables and other service equipment:

Instructions

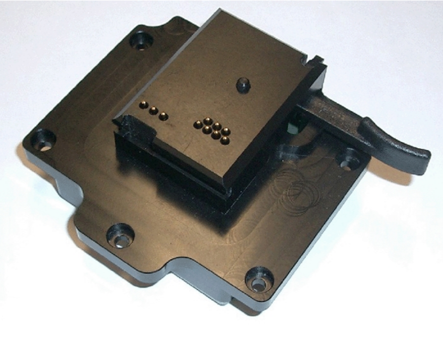
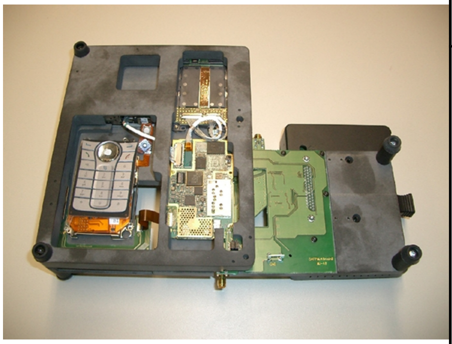
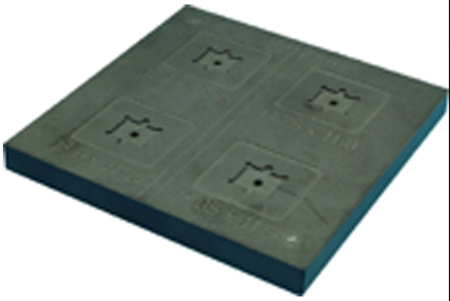
1. Connect a service tool (jig, flash adapter) to CU-4.
2. Connect CU-4 to your PC with a USB cable.
3. Connect supply voltage (12 V)
4. Connect an FBUS cable (if necessary).
5. Start Phoenix service software.

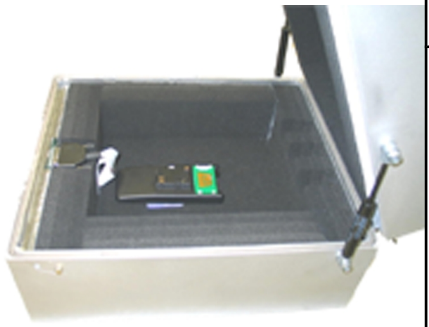


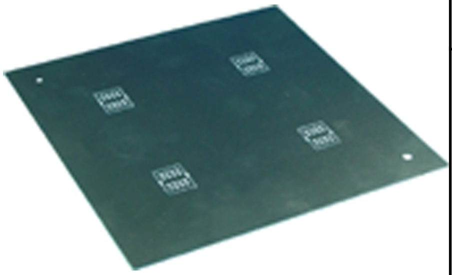
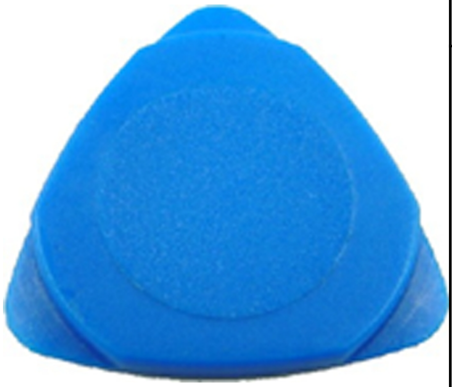
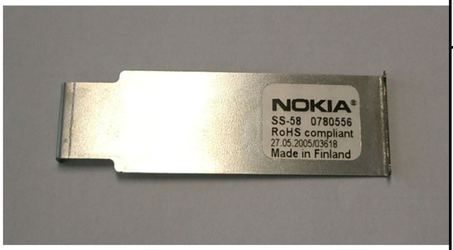
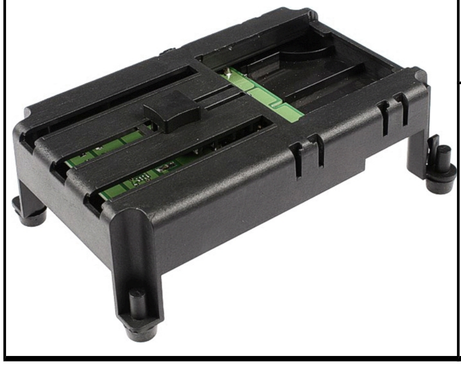
Note: Phoenix enables CU-4 regulators via USB when it is started.

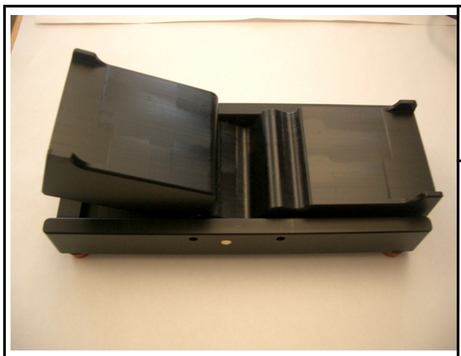
Reconnecting the power supply requires a Phoenix restart.

<table>
<tr><td rowspan="2"> </td><td>DKU-2</td><td>USB connectivity cable</td><td></td></tr>
<tr><td colspan="3">USB to system connector cable.</td></tr>
<tr><td rowspan="2"> </td><td>FPS-10</td><td>Flash prommer</td><td></td></tr>
<tr><td colspan="3">FPS-10 interfaces with:
• PC
• Control unit
• Flash adapter
• Smart card
FPS-10 flash prommer features:
• Flash functionality for BB5 and DCT-4 terminals
• Smart Card reader for SX-2 or SX-4
• USB traffic forwarding
• USB to FBUS/Flashbus conversion
• LAN to FBUS/Flashbus and USB conversion
• Vusb output switchable by PC command
FPS-10 sales package includes:
• FPS-10 prommer
• Power Supply with 5 country specific cords
• USB cable</td></tr>
</table>

<table>
<tr><td rowspan="2"></td><td>FS-1</td><td>Product specific adapter</td><td></td></tr>
<tr><td colspan="3">FS-1 is a product specific adapter, compatible with SS-62 and SS-46. It provides galvanic connection to terminal test pads.</td></tr>
<tr><td rowspan="2"> </td><td>JBT-9</td><td>Bluetooth test and interface box (sales package)</td><td></td></tr>
<tr><td colspan="3">The JBT-9 test box is a generic service device used to perform Bluetooth bit error rate (BER) testing, and establishing cordless FBUS connection via Bluetooth. An ACP-8x charger is needed for BER testing and an AXS-4 cable in case of cordless interface usage testing .
Sales package includes:
• JBT-9 test box
• Installation and warranty information</td></tr>
<tr><td rowspan="2"></td><td>MJ-48</td><td>Module jig</td><td></td></tr>
<tr><td colspan="3">MJ-48 is meant for component level troubleshooting.
The jig includes an RF interface for GSM, WCDMA and Bluetooth. In addition, it has the following features:
• Provides mechanical interface with Engine module
• Provides galvanic connection to all needed test pads in module
• Multiplexing between USB and FBUS media, controlled by Vusb
• UI test interface
• Audio components: IHF, MIC, earpiece
• Connector for control unit
• Access for Pop-Port^{TM} system connector
Note: Keymat and Engine UI assembly have to be ordered separately.
Note: In the picture CU-4 is connected to MJ-48 . CU-4 is not part of the MJ-48 sales package and has to be ordered separately.</td></tr>
<tr><td rowspan="2"></td><td>MJS-76</td><td>LGA rework jig</td><td></td></tr>
<tr><td colspan="3">This tool is used for LGA type component reworking purposes.</td></tr>
</table>

<table>
<tr><td rowspan="2"> </td><td>PCS-1</td><td>Power cable</td><td></td></tr>
<tr><td colspan="3">The PCS-1 power cable (DC) is used with a control unit CU-4 to supply a controlled operating voltage.</td></tr>
<tr><td rowspan="2"> </td><td>PKD-1</td><td>SW security device</td><td></td></tr>
<tr><td colspan="3">SW security device is a piece of hardware enabling the use of the service software when connected to the parallel (LPT) port of the PC.
Without the device, it is not possible to use the service software.
Printer or any such device can be connected to the PC through the device if needed.</td></tr>
<tr><td rowspan="2"></td><td></td><td>RF shield box</td><td></td></tr>
<tr><td colspan="3">Because the WCDMA network disturbs the RX side testing of the WCDMA phone and the Tx signal of the WCDMA phone can severely disturb the WCDMA network, a shield box is needed in all testing, tuning and fault finding which requires WCDMA RF signal.
The shield box is not an active device, it contains only passive filtering components for RF attenuation.</td></tr>
<tr><td rowspan="2"> </td><td>RJ-89</td><td>Rework jig</td><td></td></tr>
<tr><td colspan="3">RJ-89 is a soldering jig used for soldering and as a rework jig for the engine module.</td></tr>
<tr><td rowspan="2"> </td><td>SA-81</td><td>RF coupler</td><td></td></tr>
<tr><td colspan="3">SA-81 is a coupler for WCDMA / GSM RF testing. It is used together with SS-62 flash adapter base.</td></tr>
</table>

<table>
<tr><td rowspan="2"></td><td>SES-3</td><td>Stencil</td><td></td></tr>
<tr><td colspan="3">SES-3 stencil is used with MJS-76 / 0770417 and it supports the PA component.
SES-3 is made for reworking purposes used in central service level.</td></tr>
<tr><td rowspan="2"></td><td>SRT-6</td><td>Opening tool</td><td></td></tr>
<tr><td colspan="3"></td></tr>
<tr><td rowspan="2"> </td><td>SS-46</td><td>Interface adapter</td><td></td></tr>
<tr><td colspan="3">SS-46 acts as an interface adapter between the flash adapter and FPS-10.</td></tr>
<tr><td rowspan="2"> </td><td>SS-58</td><td>Rework tool</td><td></td></tr>
<tr><td colspan="3"></td></tr>
<tr><td rowspan="2"></td><td>SS-62</td><td>Generic flash adapter base for BB5</td><td></td></tr>
<tr><td colspan="3">• generic base for flash adapters and couplers
• SS-62 equipped with a clip interlock system
• provides standardised interface towards Control Unit
• provides RF connection using galvanic connector or coupler
• multiplexing between USB and FBUS media, controlled by VUSB</td></tr>
</table>

	SS-67	Assembly jig for mechanics disassembly/ reassembly	
	SX-4	Smart card	
	SX-4 is a BB5 security device used to protect critical features in tuning and testing. SX-4 is also needed together with FPS-10 when DCT-4 phones are flashed.		
	XCS-4	Modular cable	
	XCS-4 is a shielded (one specially shielded conductor) modular cable for flashing and service purposes.		
	XRF-1	RF cable	
	The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment. SMA to N-Connector ca. 610mm. Attenuation for: • GSM850/900: 0.3+-0.1 dB • GSM1800/1900: 0.5+-0.1 dB • WLAN: 0.6+-0.1dB		

Service concepts

Flash concept with FPS-10

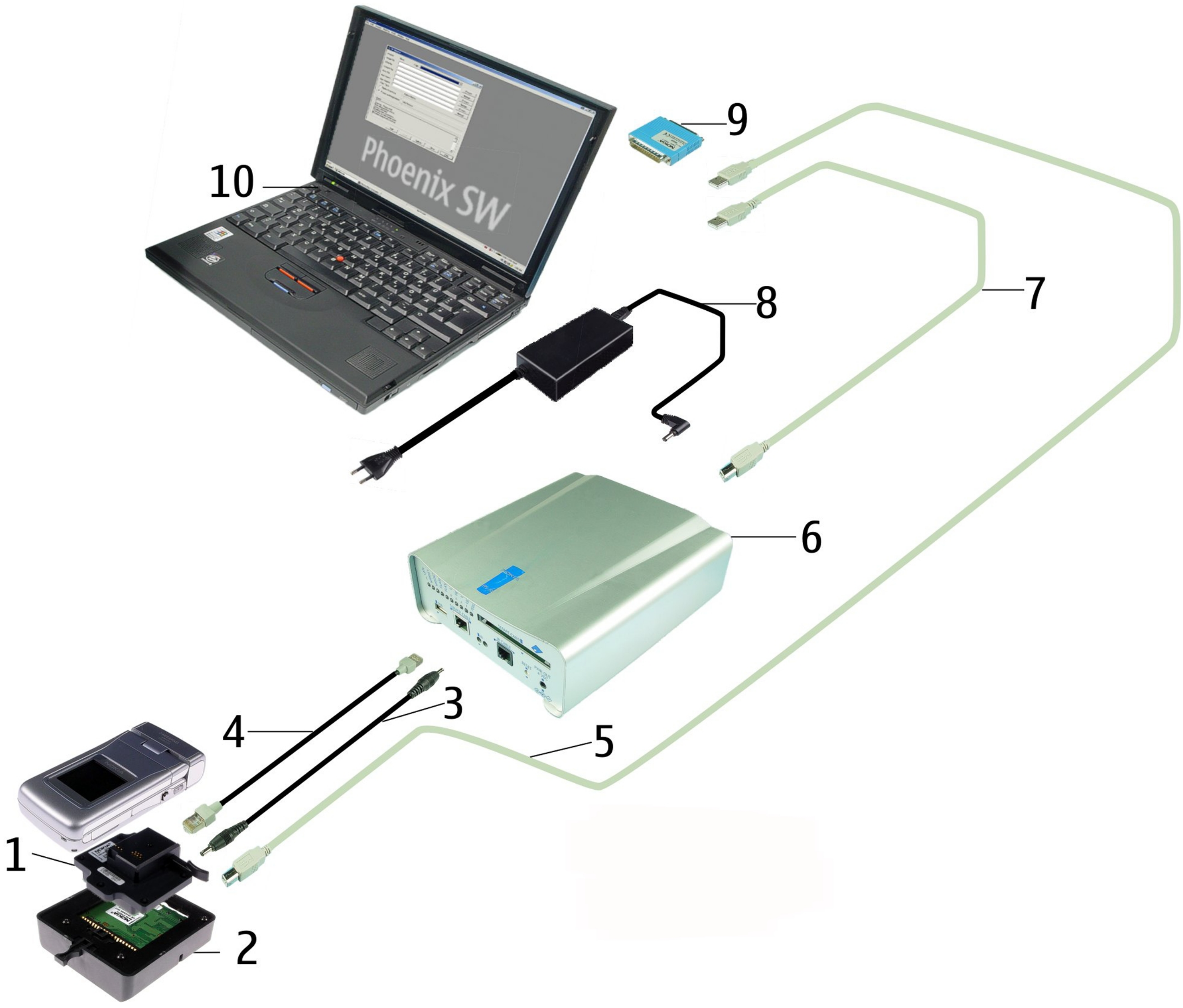


Figure 30 Basic flash concept with FPS-10

Item	Type	Description
1	FS-1	Product specific adapter
2	SS-46	Interface adapter
3	CA-35S	Power cable
4	XCS-4	Modular cable
5		Standard USB cable
6	FPS-10	Flash prommer box
7		Standard USB cable

Item	Type	Description
8		Power adapter
9	PKD-1	SW security device
10	PC	PC with Phoenix software

MJ-48 module jig concept

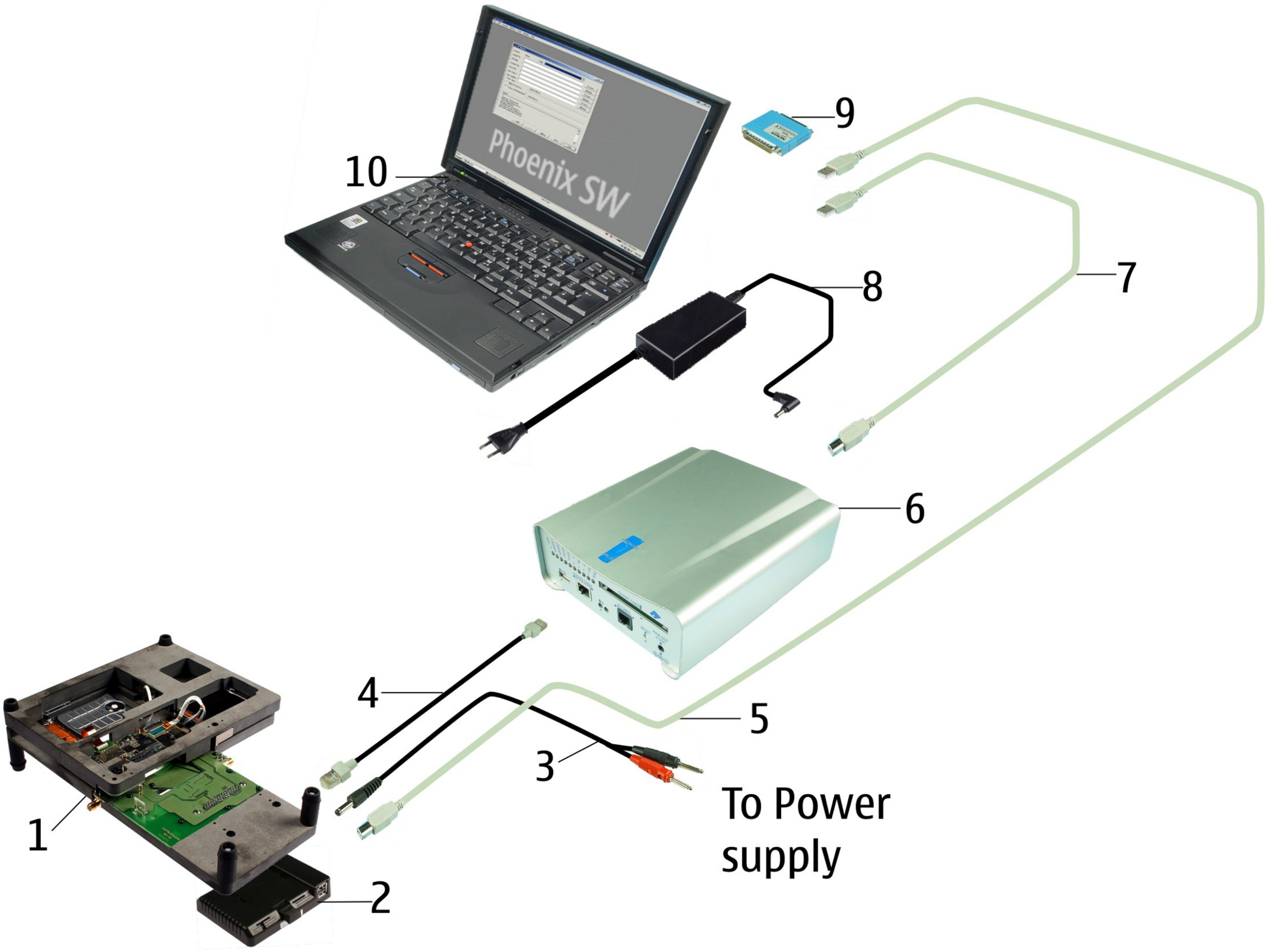


Figure 31 MJ-48 module jig service concept

Item	Type	Description
1	MJ-48	Module jig **Note:** Keymat 9797815 and Engine UI assembly 0211444 have to be ordered separately.
2	CU-4	Control unit
3	PCS-1	DC power cable
4	XCS-4	Modular cable

Item	Type	Description
5		Stardard USB cable
6	FPS-10	Flash prommer box
7		Standard USB cable
8		Power adapter
9	PKD-1	SW security device
10	PC	PC with Phoenix software
11		RF shield box

Note: Item 11 not shown in the picture.

POS (Point of Sale) flash concept

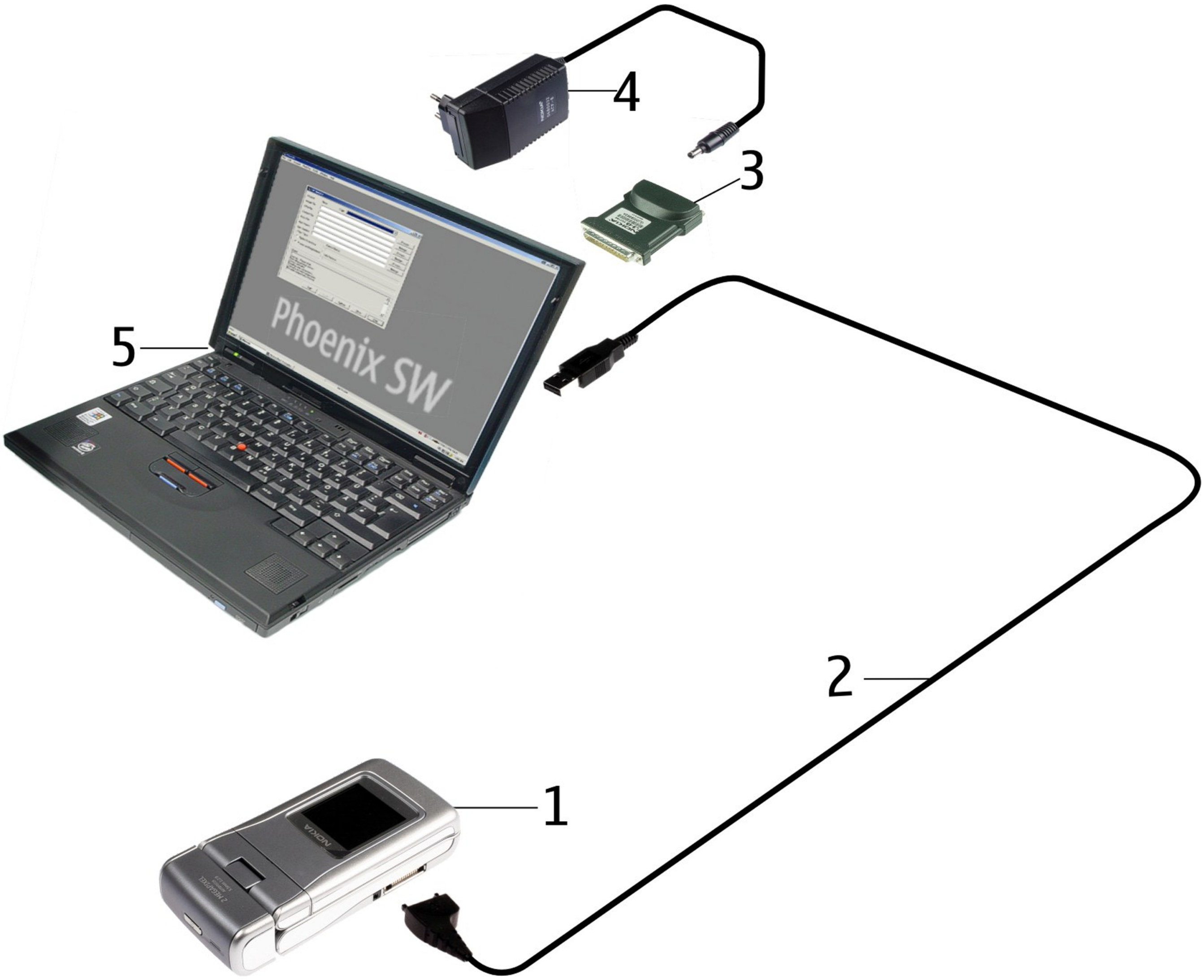


Figure 32 POS flash concept

Item	Type	Description
1	RM-42	Phone

Item	Type	Description
2	DKU-2/CA-53	USB connectivity cable
3	PKD-1	Security dongle
4	AC-4	Charger
5	PC	PC with Phoenix software

Service concept for RF testing and RF/BB tuning

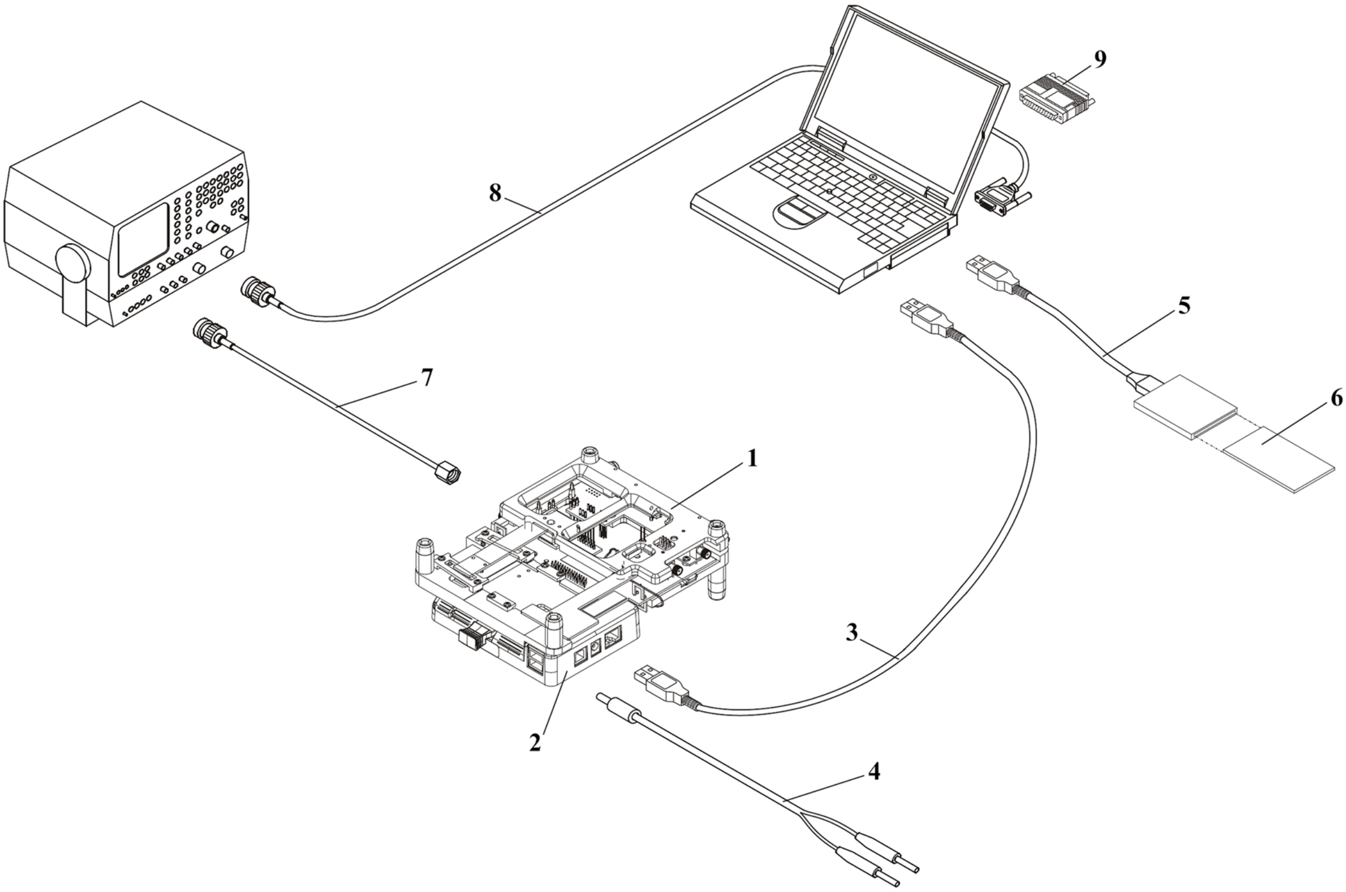


Figure 33 Service concept for RF testing and RF/BB tuning

Item	Description	Type
1	MJ-48	Module jig
2	CU-4	Control unit
3		Standard USB cable
4	PCS-1	DC power cable
5		Standard USB cable + smart card reader
6	SX-4	Smart card
7	XRS-6	RF cable
8		GPIB control cable

Item	Description	Type
9	PKD-1	SW security device
10		RF shield box

Note: Item 10 not shown in the picture.

CU-4 flash concept with FPS-10

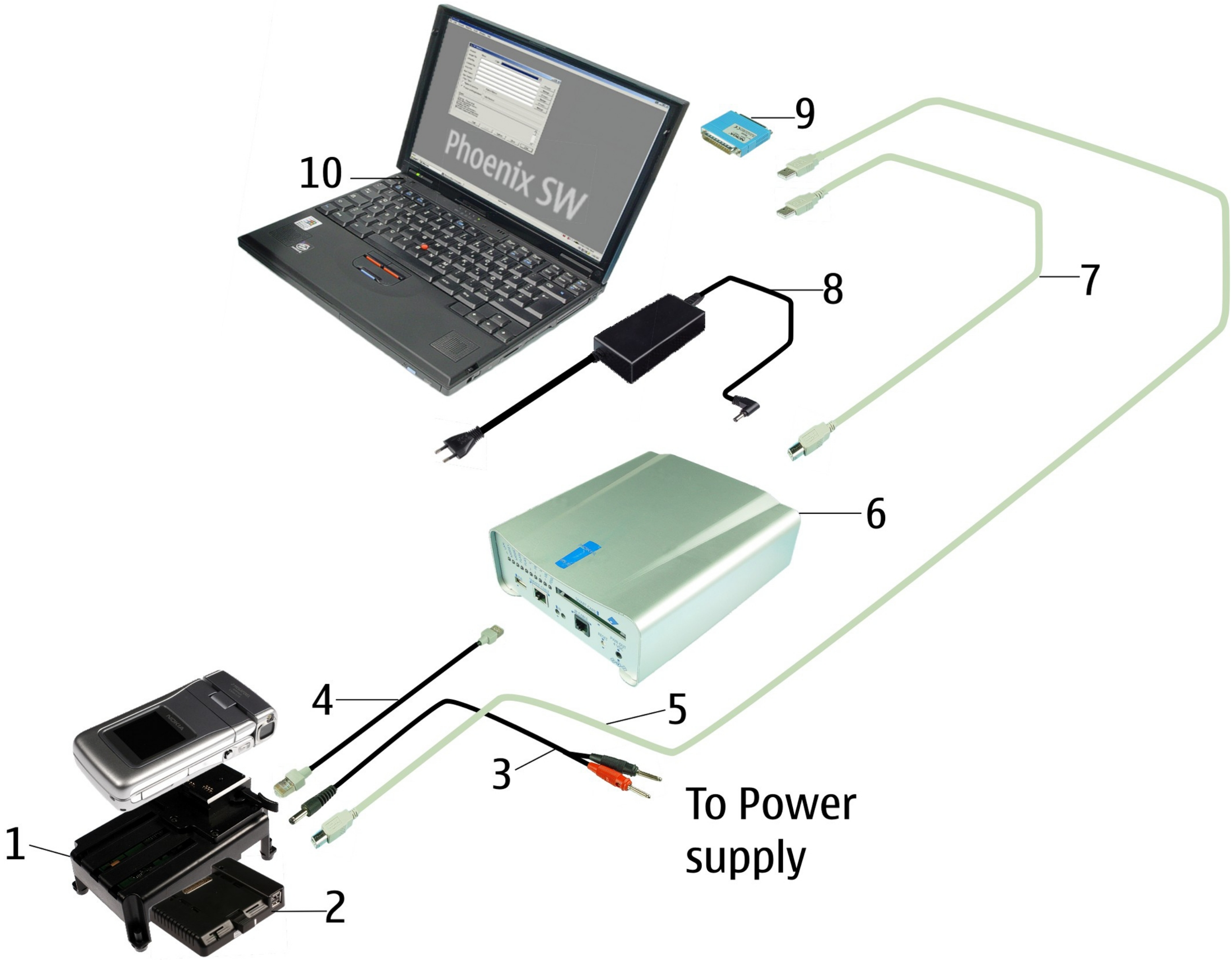


Figure 34 CU-4 flash concept with FPS-10

Item	Description	Type
1	FS-1	Product specific adapter
2	CU-4	Control unit
3	PCS-1	Power cable
4	XCS-4	Modular cable
5		Standard USB cable
6	FPS-10	Flash prommer box

Item	Description	Type
7		Standard USB cable
8		Power adapter
9	PKD-1	SW security device
10	PC	PC with Phoenix software

RF testing concept with RF coupler

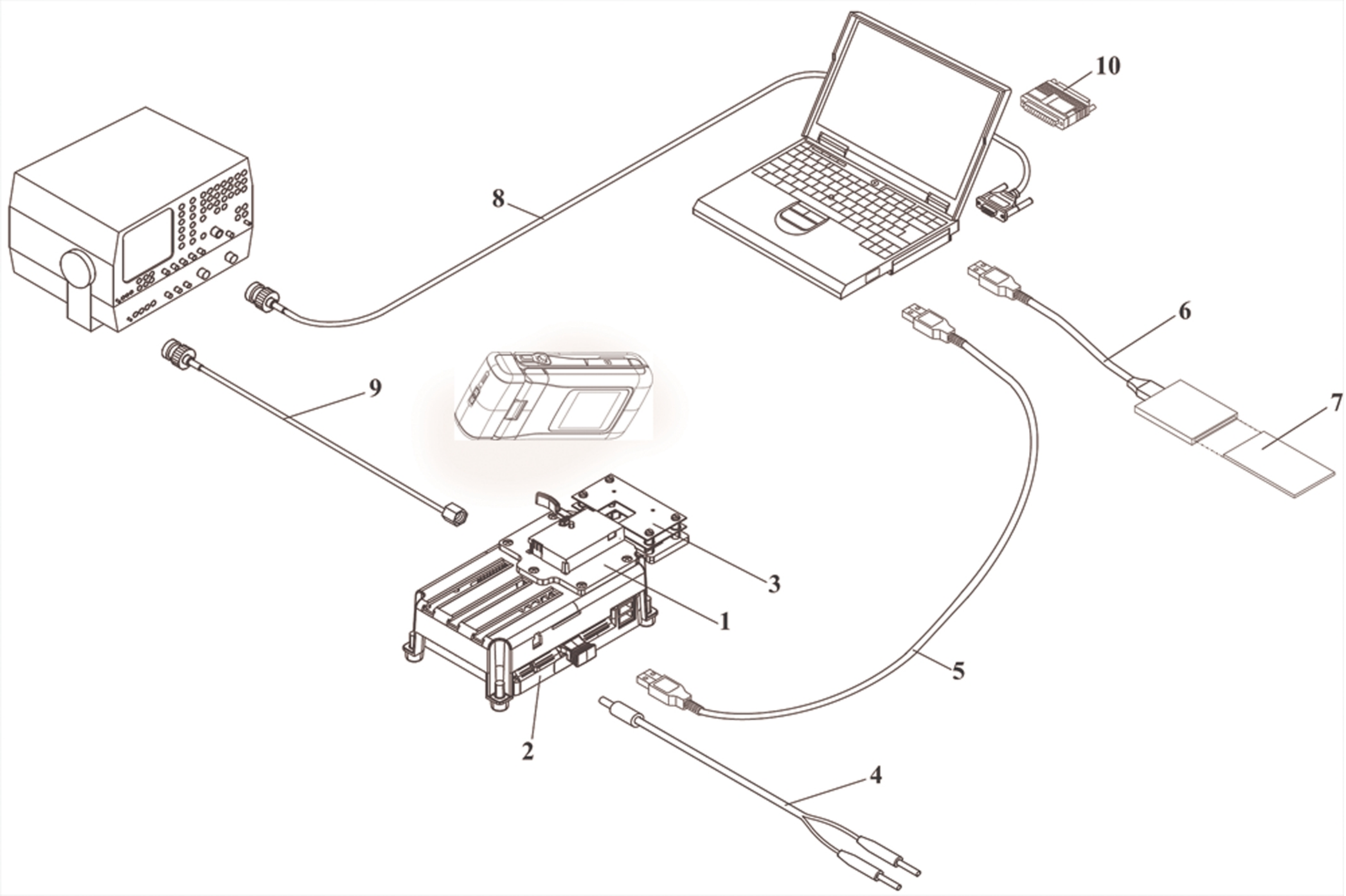


Figure 35 RF testing concept with RF coupler

Item	Type	Description
1	SS-62 + FS-1	Flash adapter base + product specific adapter
2	CU-4	Control unit
3	SA-81	RF coupler
4	PCS-1	Power cable
5		Standard USB cable
6		Standard USB cable + smart card reader
7	SX-4	Smart card

Item	Type	Description
8		GPIB control cable
9	XRS-6	RF cable
10	PKD-1	SW security device
11		RF shield box

Note: Item 11 not shown in the picture.

5 — Disassembly / Reassembly Instructions

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General information on RM-42 disassembly / reassembly

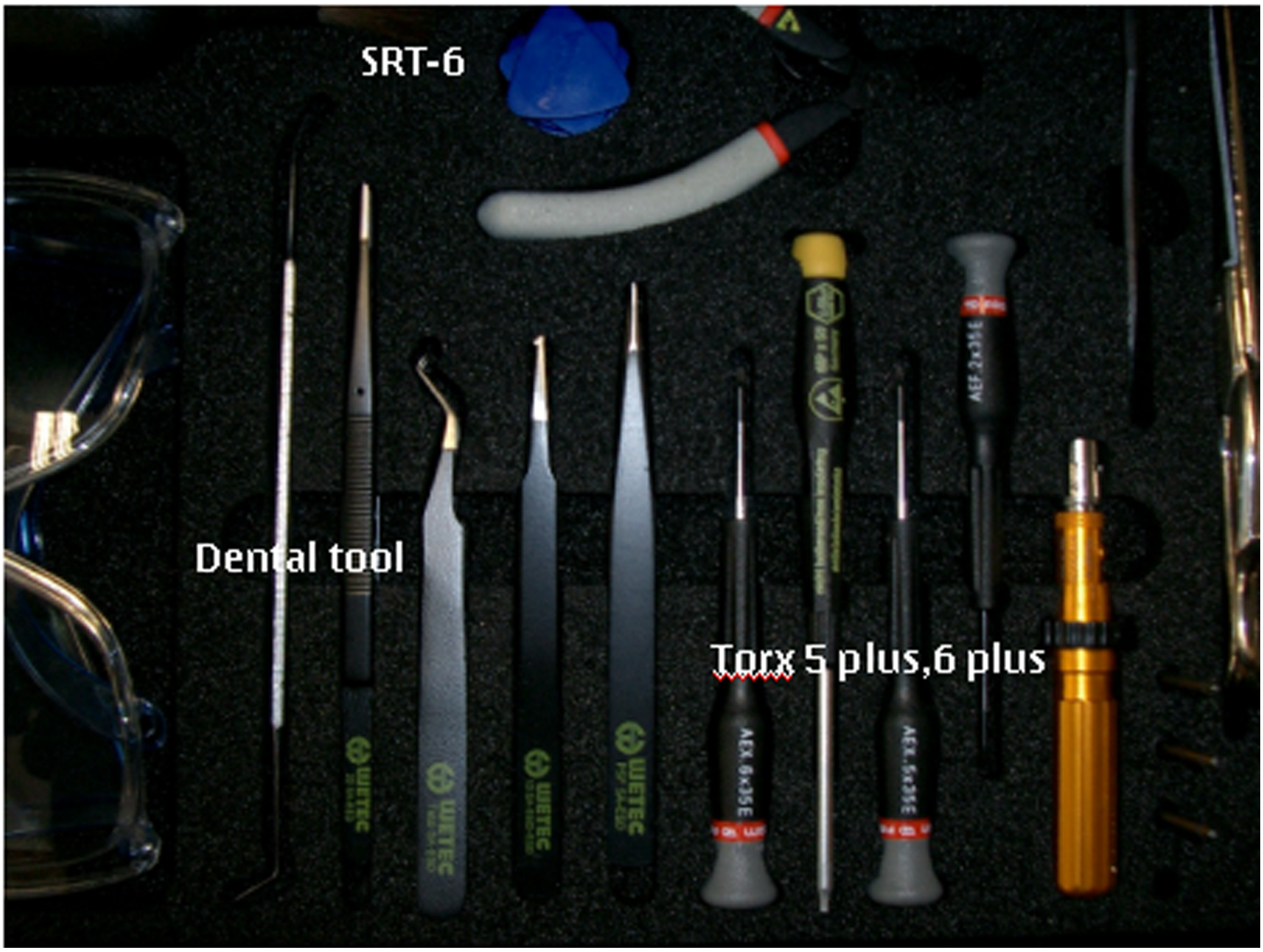


Figure 36 Required tools for RM-42 disassembly / reassembly

Reassembly takes place in the reverse order.

Disassembly / reassembly instructions

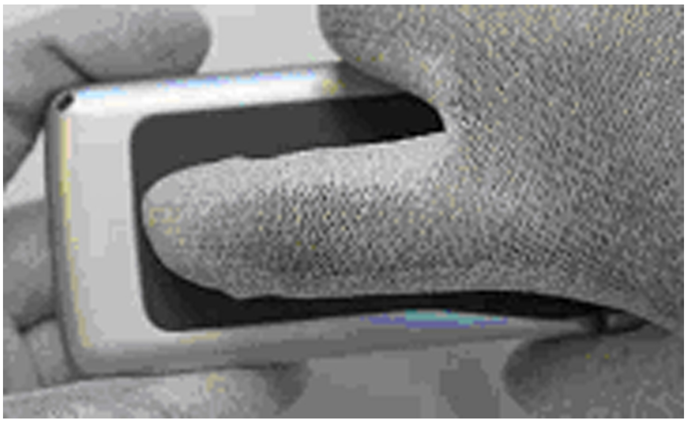
Before you begin

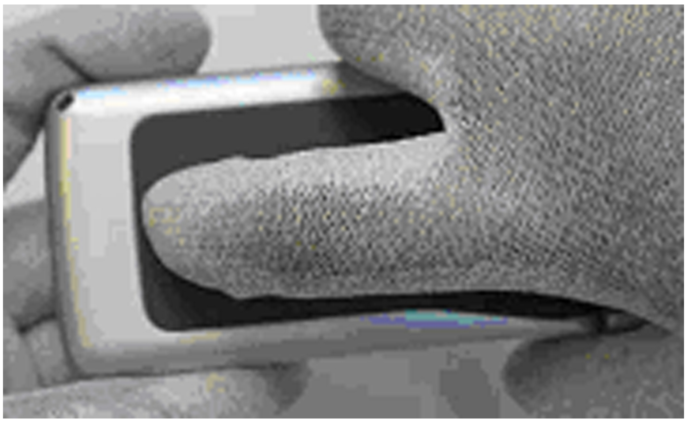
Note: Use the following torque values:

- Camera: 4 pcs. PT1,6 x 5, T5+ 16 Ncm +/-1Ncm. 350 rpm/508U Deprag
- I-cover: 2 pcs. PT1,8 x 8,5 T6+ 22Ncm. 560 rpm. Debrag
- Rest: 19 Ncm +/-1Ncm. 560 rpm 708U Debrag

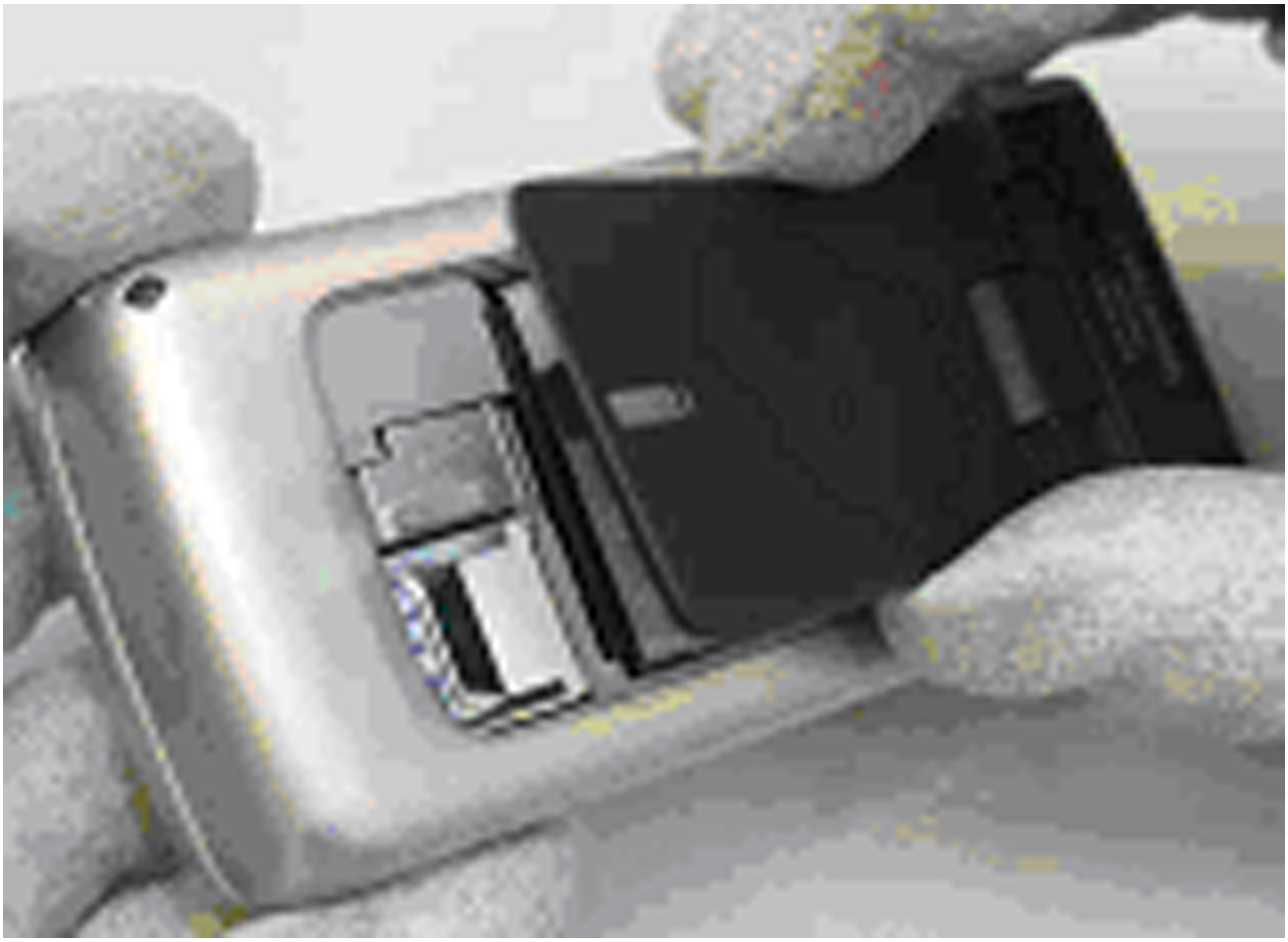
Steps

1. To remove the **Battery Cover** press the release button and remove the battery cover, Remove pop-port cover if needed.

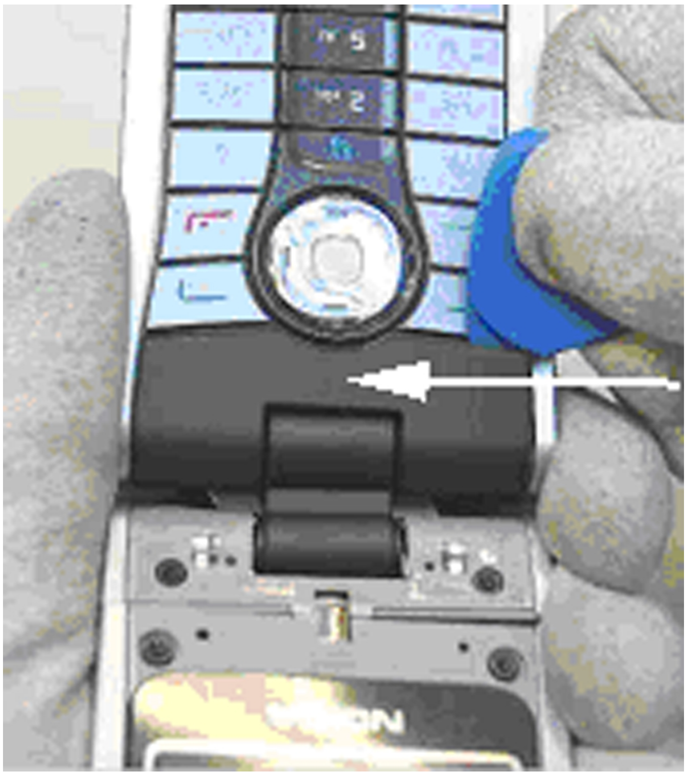




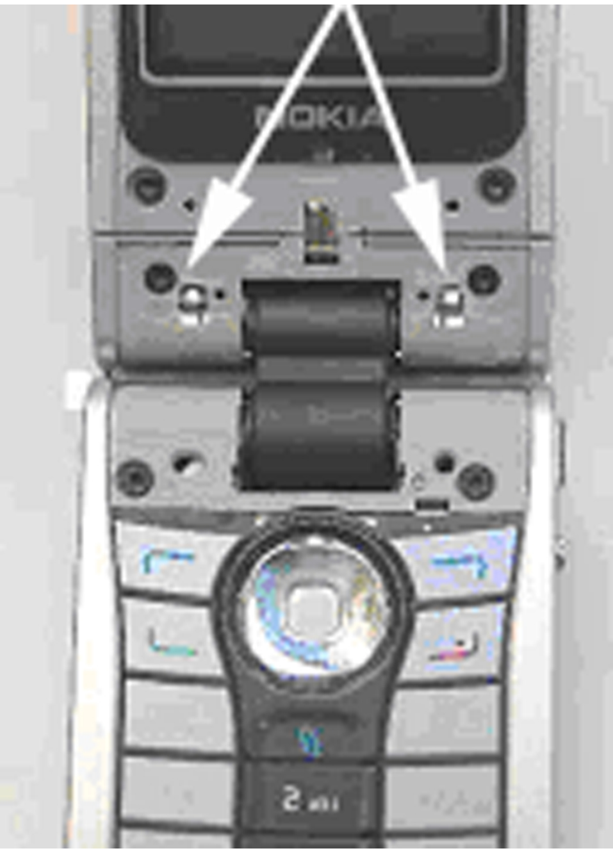
2. Open the **D-cover trim** carefully by using SRT-6 tool. For assembly, be sure adhesive is good enough or change also **D-cover**.



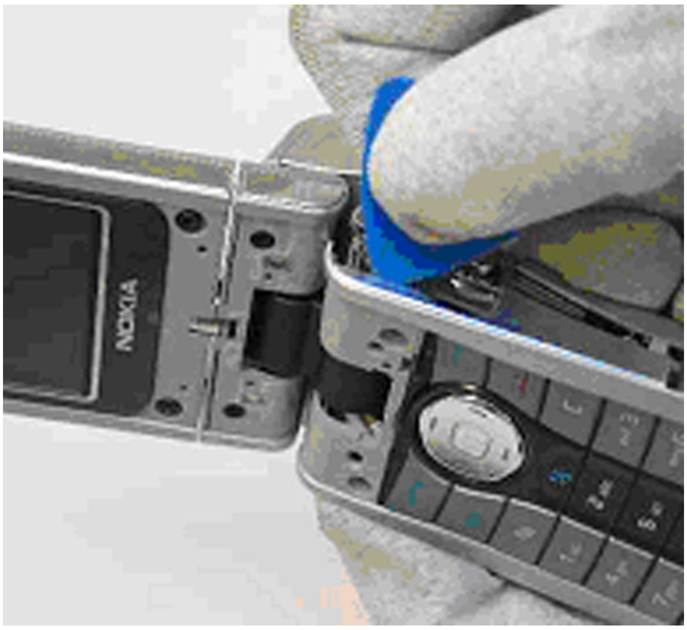
3. Use the SRT-6 (or screwdriver) to open the snaps of the **I-Cover Trim**. Slide SRT-6 (screwdriver) for opening all snaps.



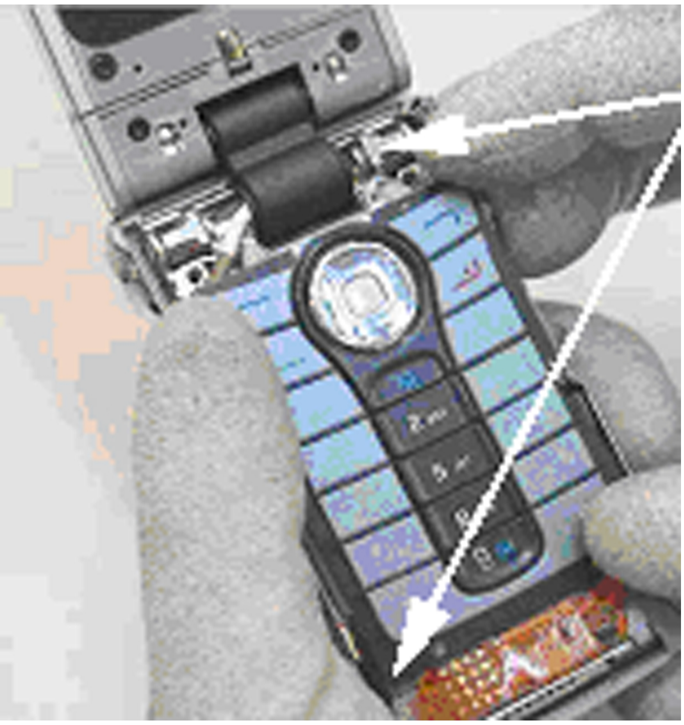
4. Unscrew the two Torx Plus size 6 screws.



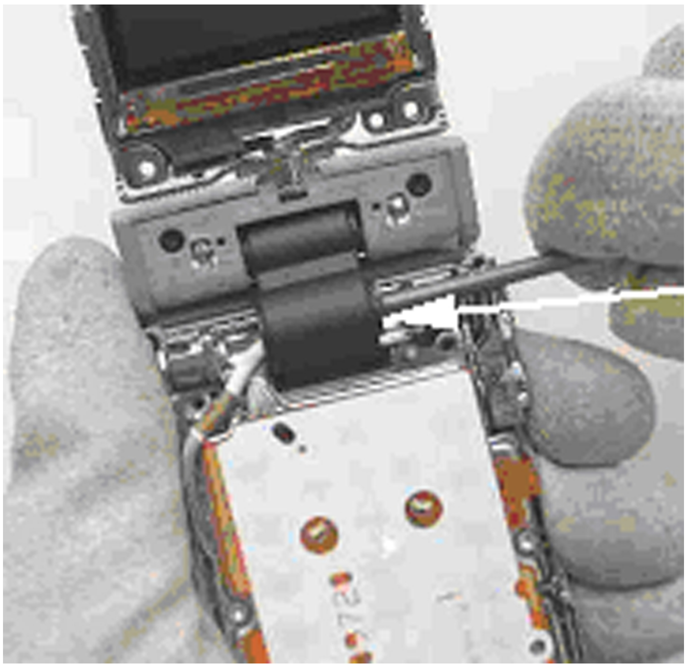
5. Use the SRT-6 as a lever to open the snaps of the I-cover assy. Remove the I-cover assy carefully.

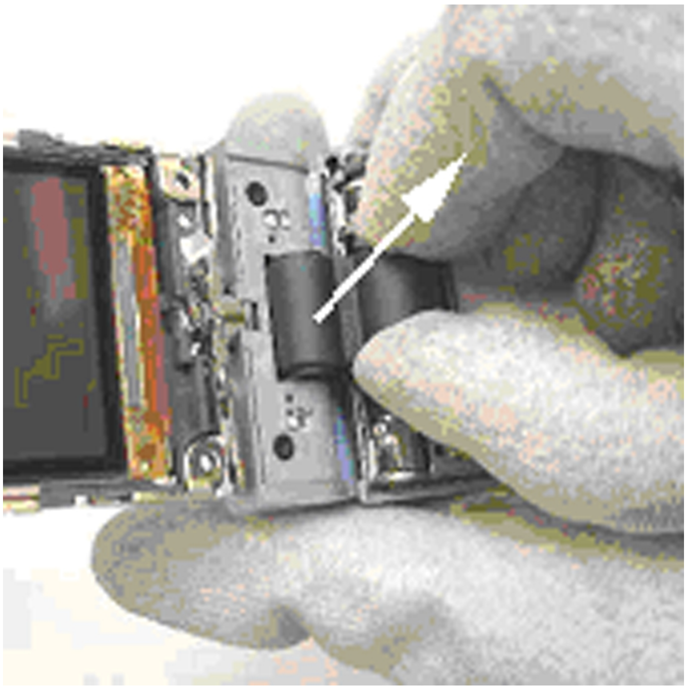


6. Remove **Keymat** carefully. Note not to damage guiding pins.

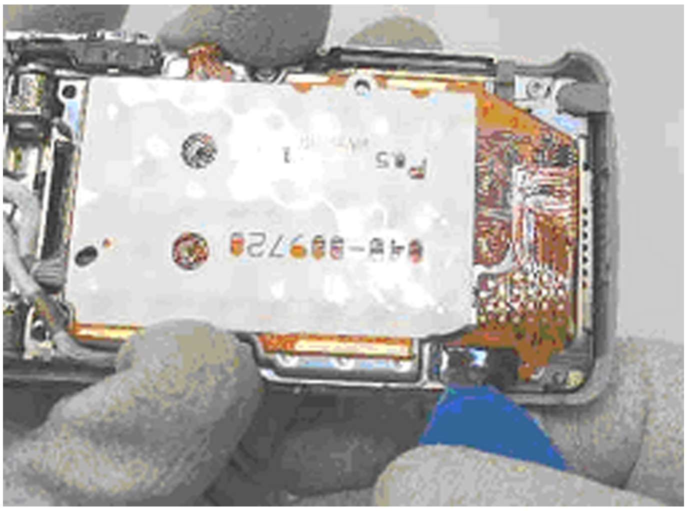


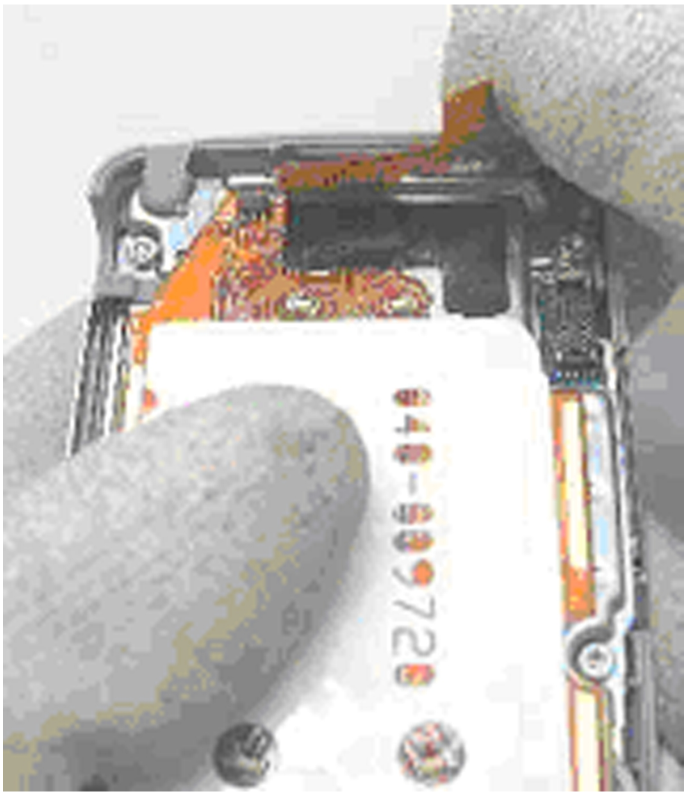
7. Remove **E-cover** with tweezers as shown in the picture.



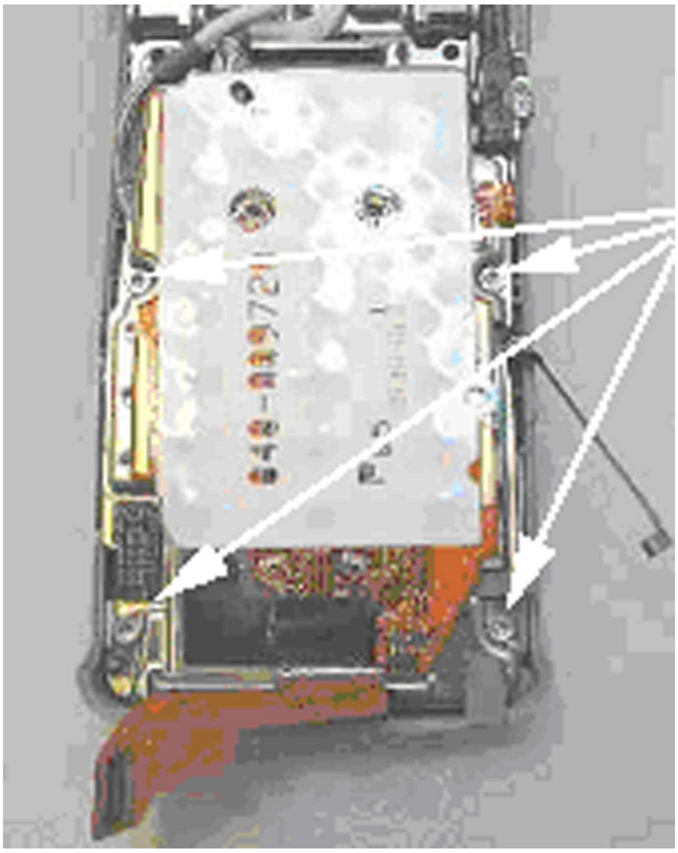


8. Open the flex connector of **Engine UI Assy** carefully by using SRT-6.

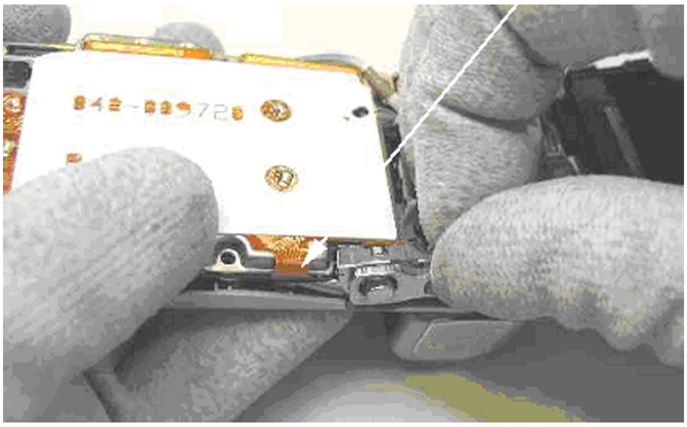




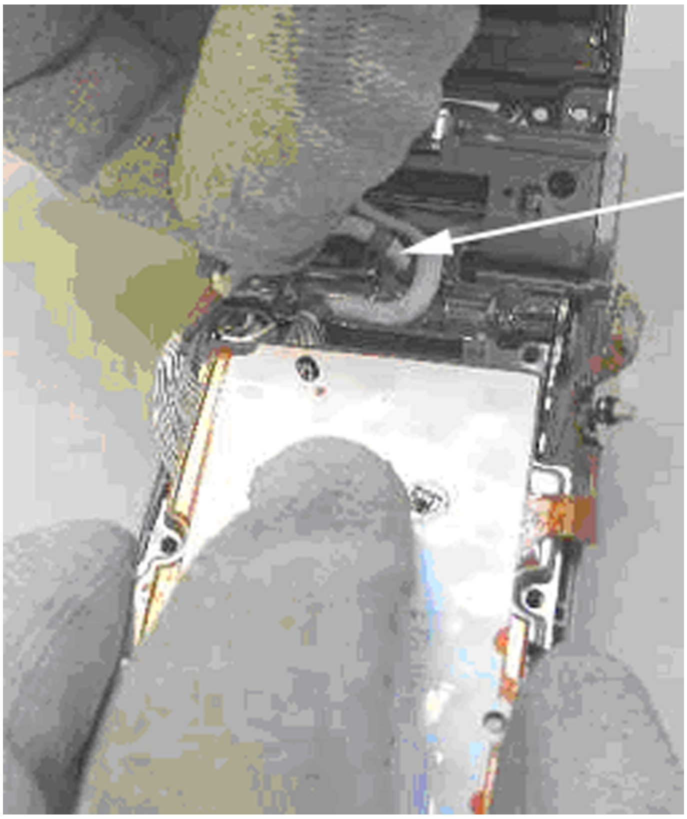
9. Unscrew the four torx Plus size 6 screws of **Engine UI Assy** and open the **MMC Cover Assy**. For assembly, the torque driver with a torque of 18 Ncm has to be used.



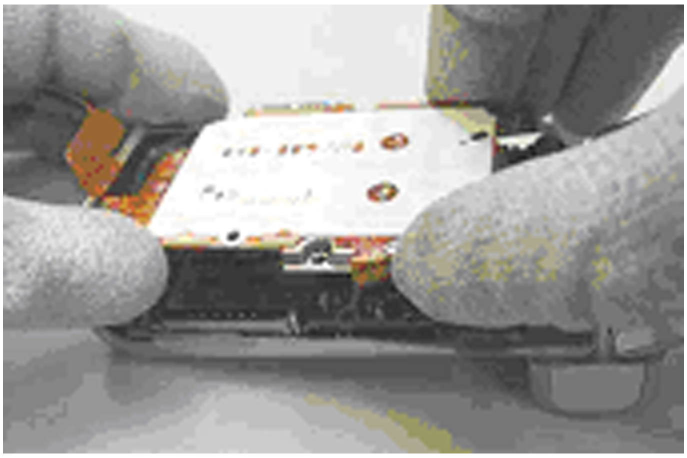
10. Lift the **Side Key Bezel** from **H-cover** carefully. Locking snap.



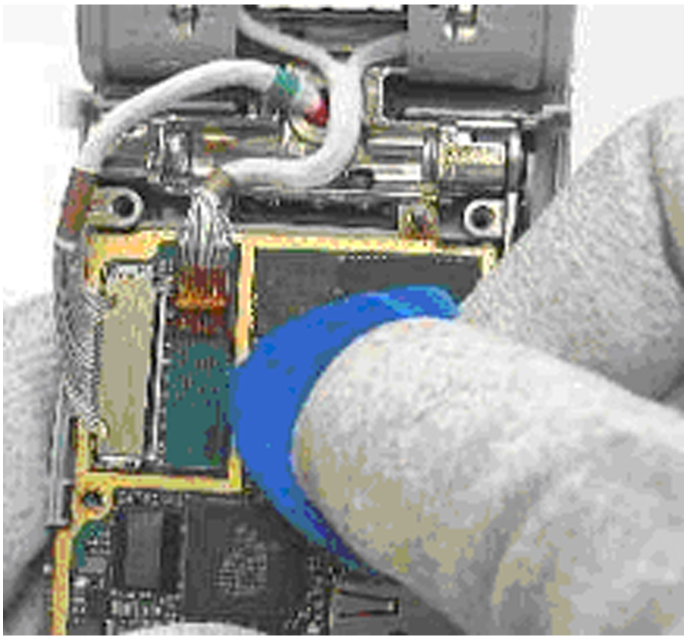
11. Pull coaxcial cable out of the Hinge so far as red mark is visible. Remove cable from abone of **UI Engine Assy**.



12. Remove the **UI Engine Assy** from the guiding pins.

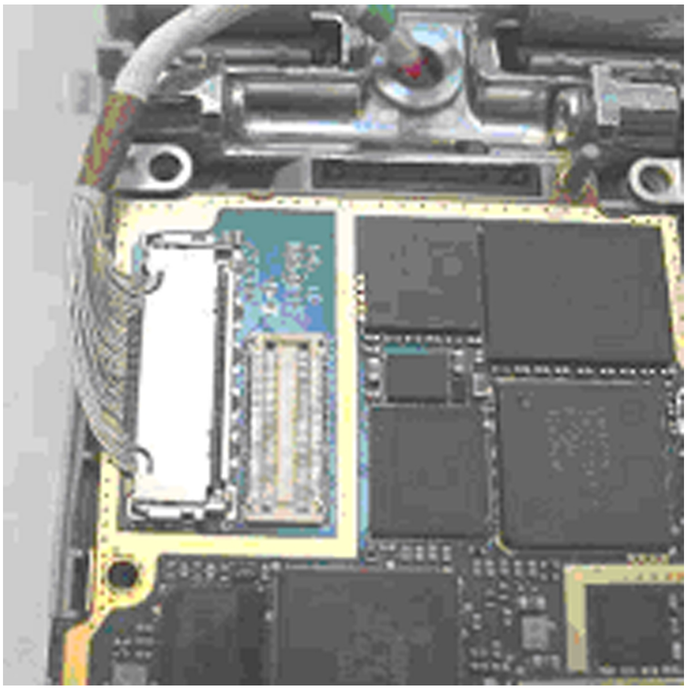


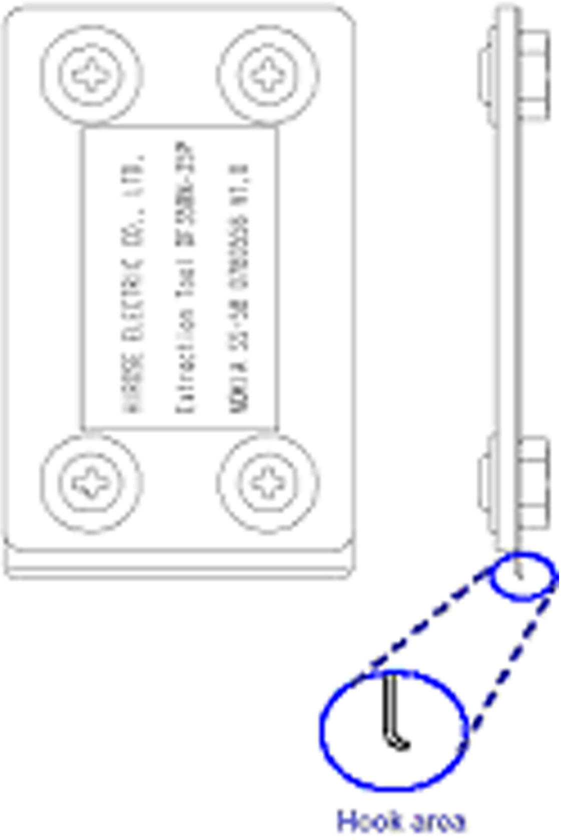
13. Use SRT-6 to open **Display Unit connector**. Be careful not to damage the connector and components next to it.

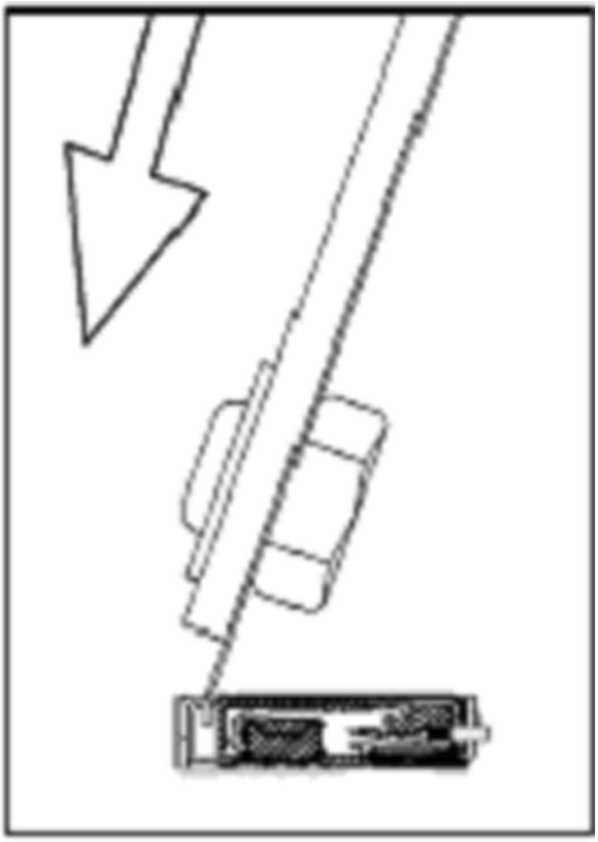


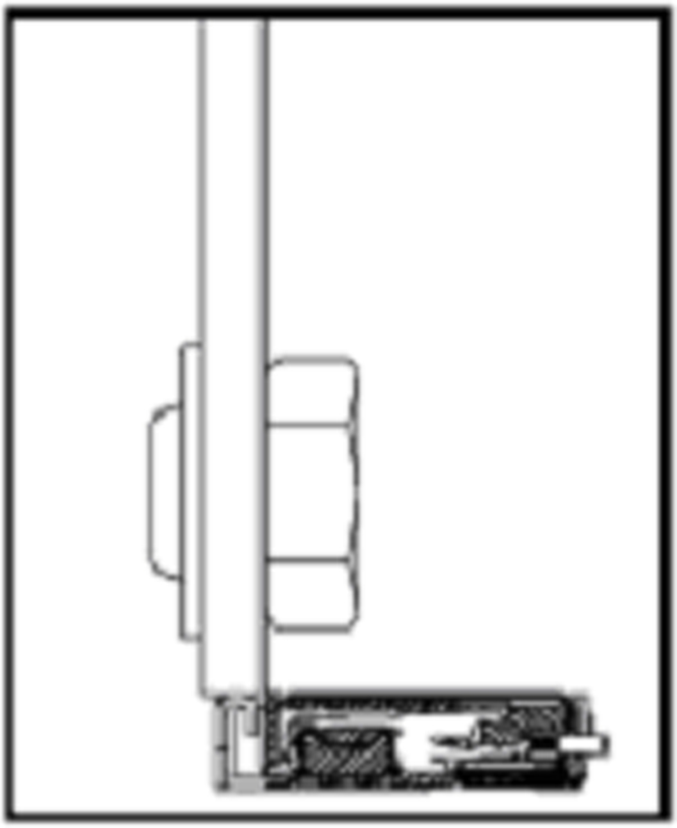
14. Use SS-57 rework tool to open **Camera Module connector**.

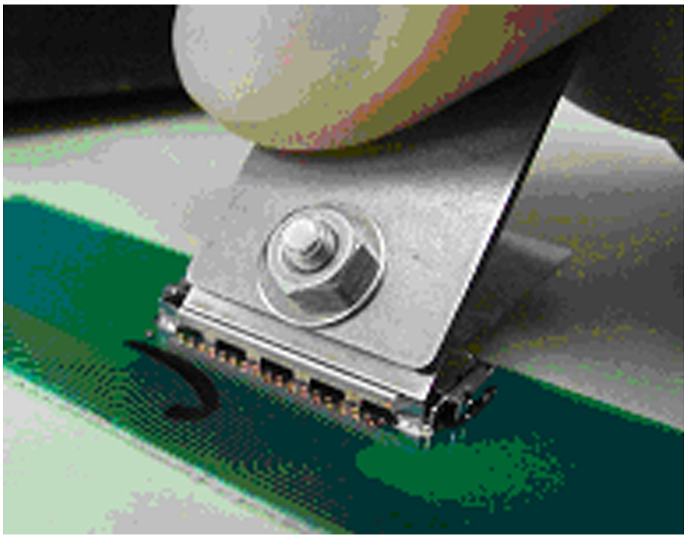
Note: Notice the SS-57 rework tool instructions.

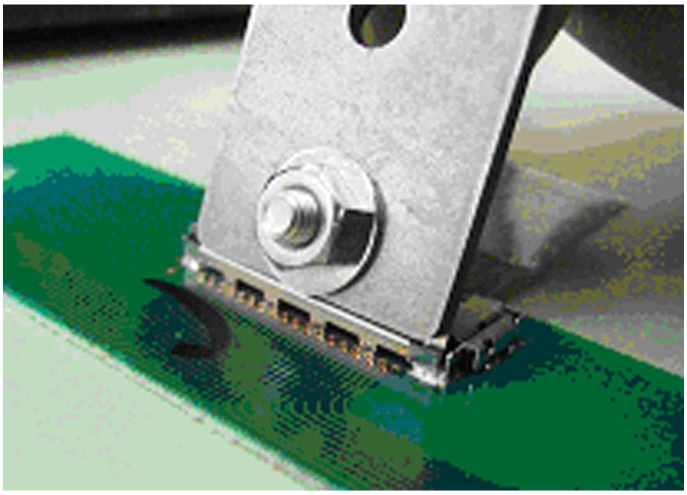



Hook area

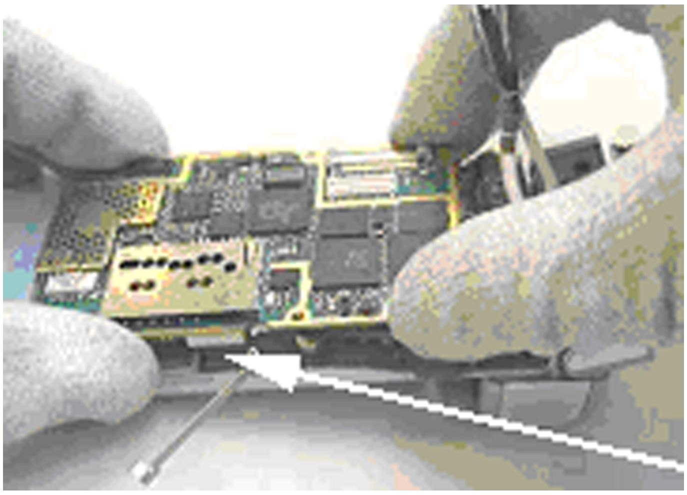




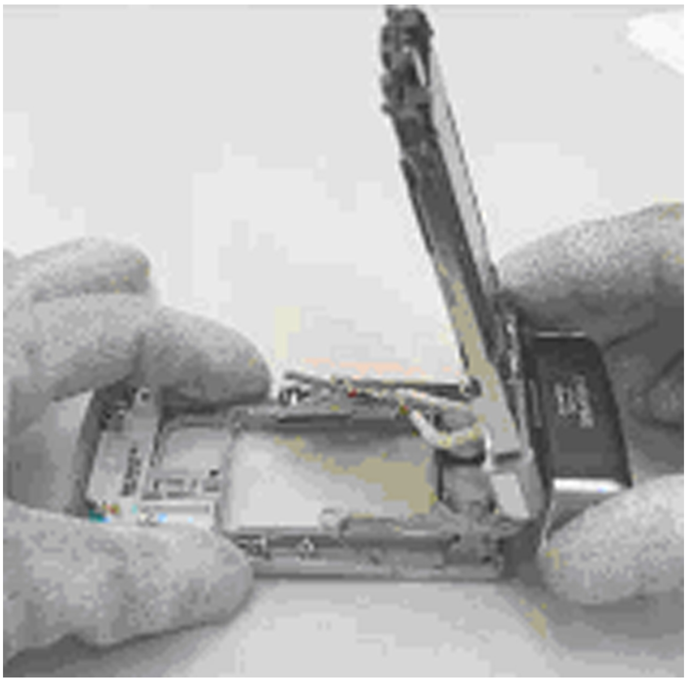




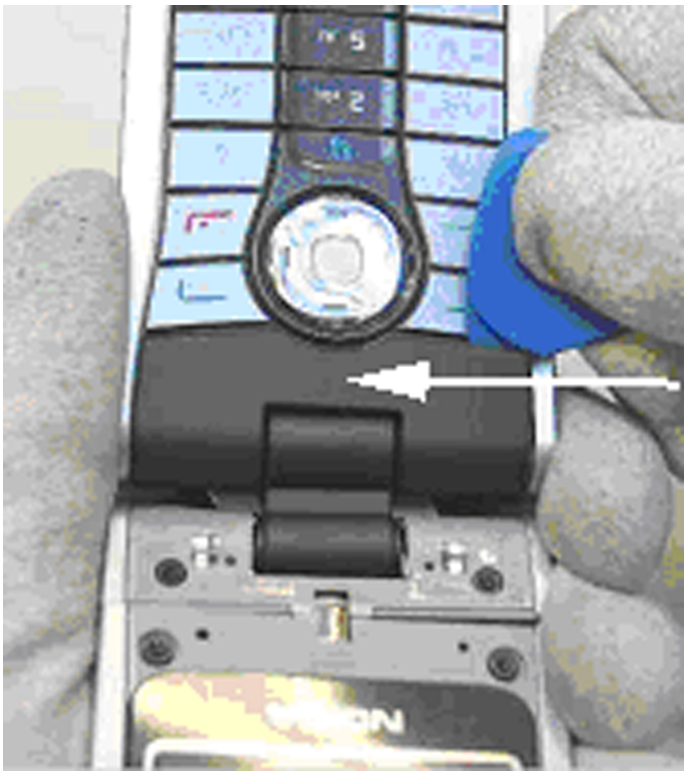
15. Remove the **PWB** carefully. Note not to damage the **MMC Door Switch**.



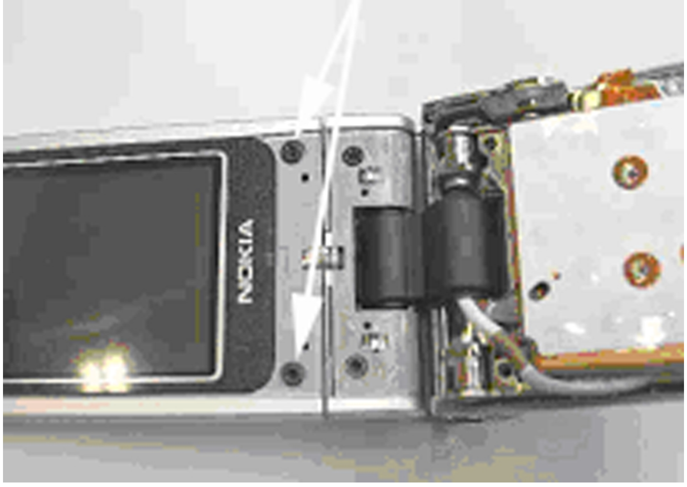
16. Remove **H-cover Assy** carefully from the Hinge bracket



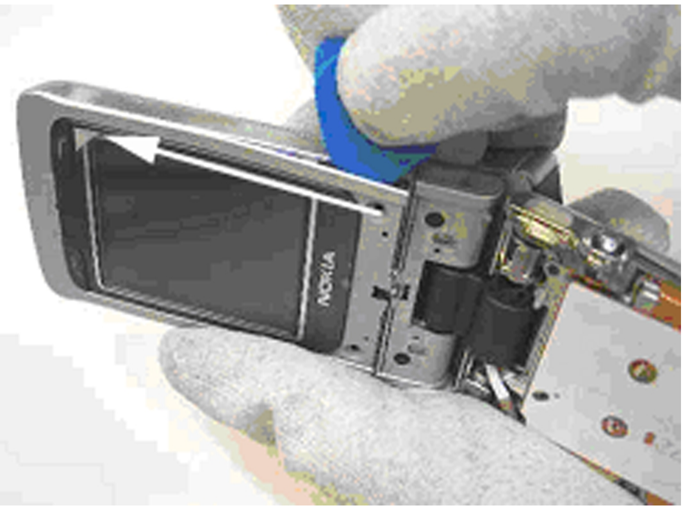
17. Open the**I-cover trim** carefully by using SRT-6 tool. For assembly, every time replace old trim a new one and wipe out adhesive from **B-cover** if necessary.



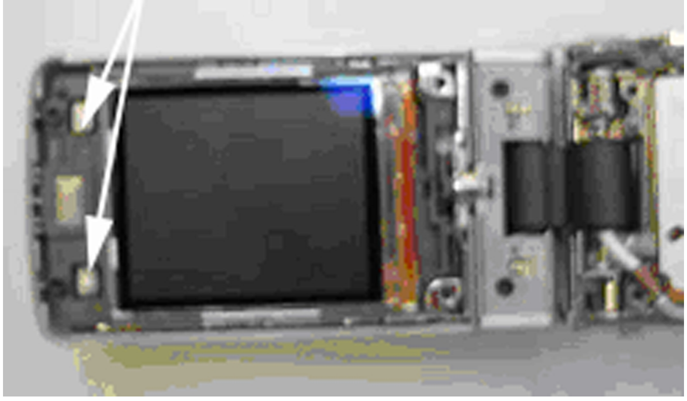
18. Unscrew the two Torx Plus size 6 screws. For assembly, use screwdrive torque 19 Ncm.



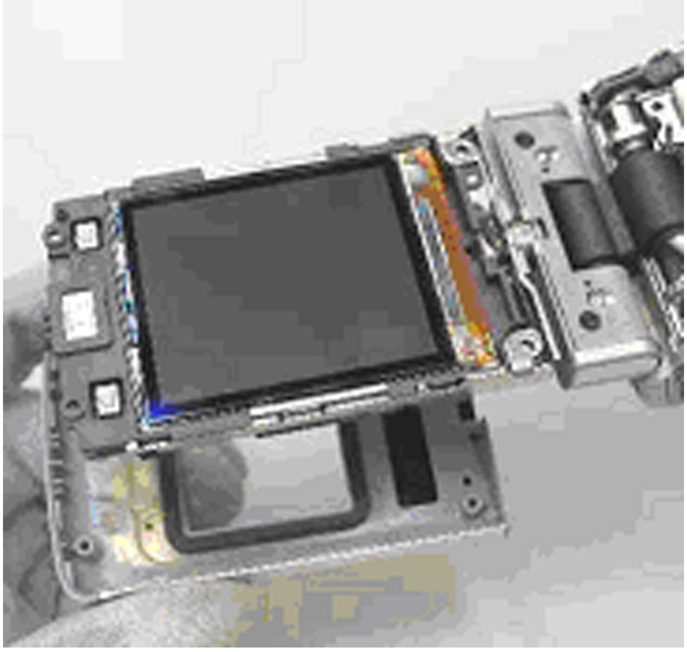
19. Use SRT-6 when removing **B-cover**. Open both sides.



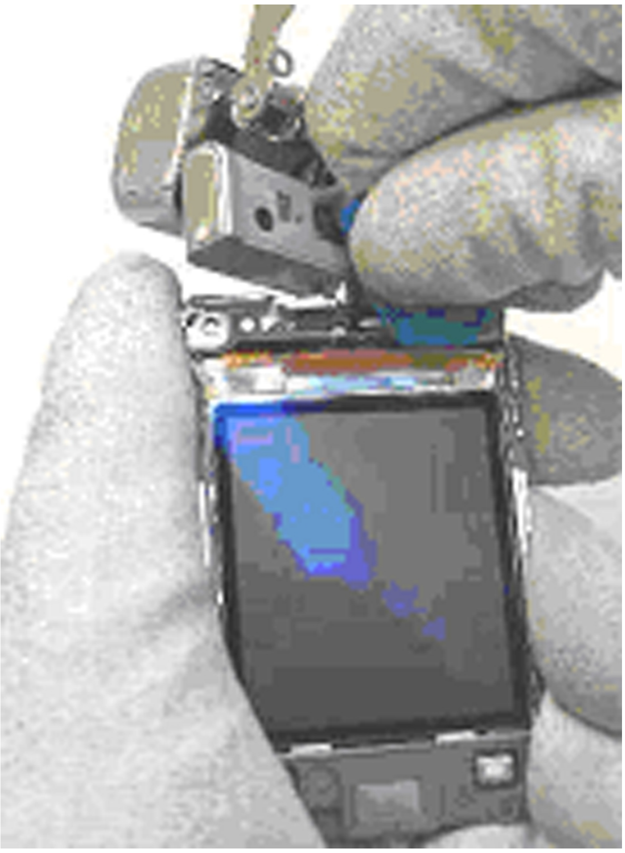
20. Unscrew the two Torx Plus size 6 screws

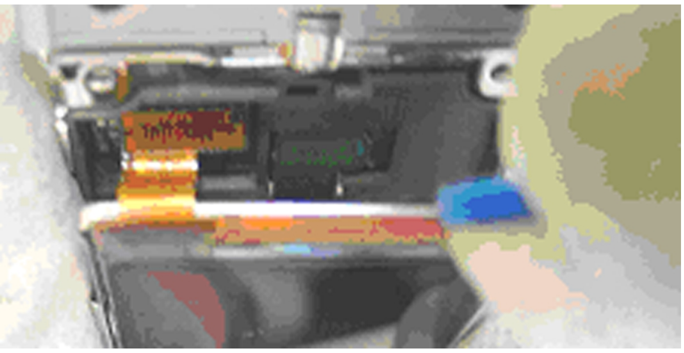


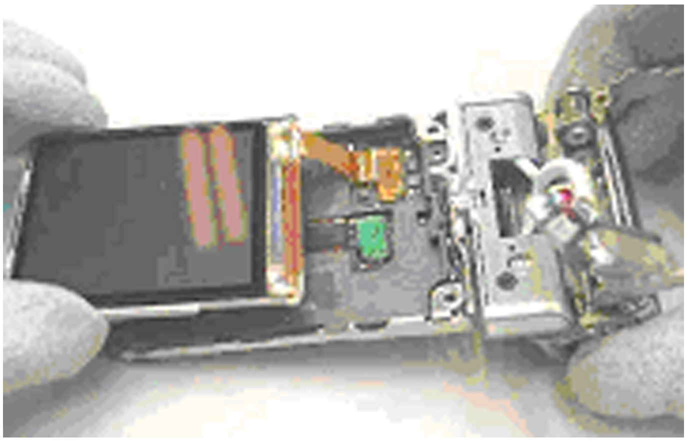
21. Remove **A-cover** by lifting upper part.



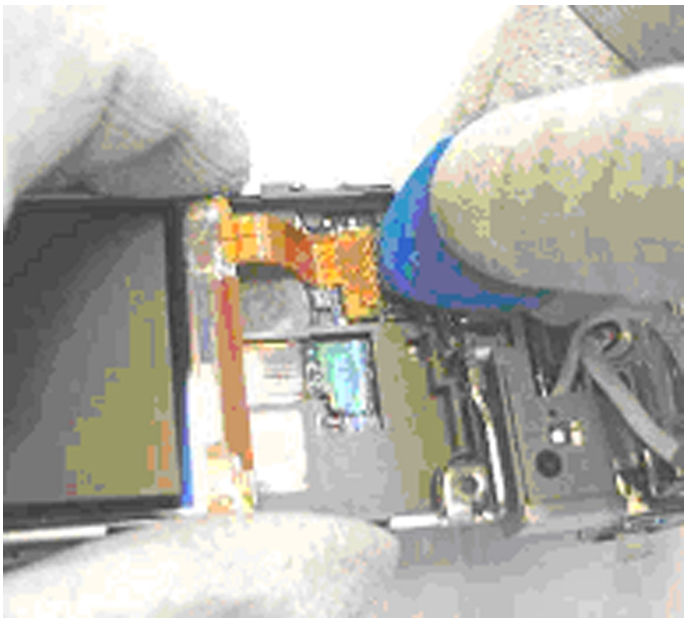
22. Remove **K2 display** by lifting edge of display metal part.



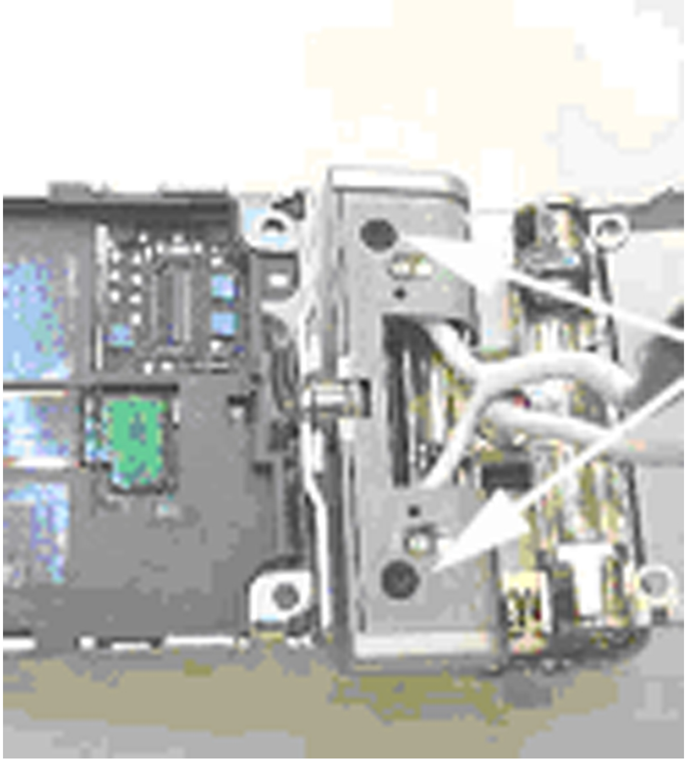




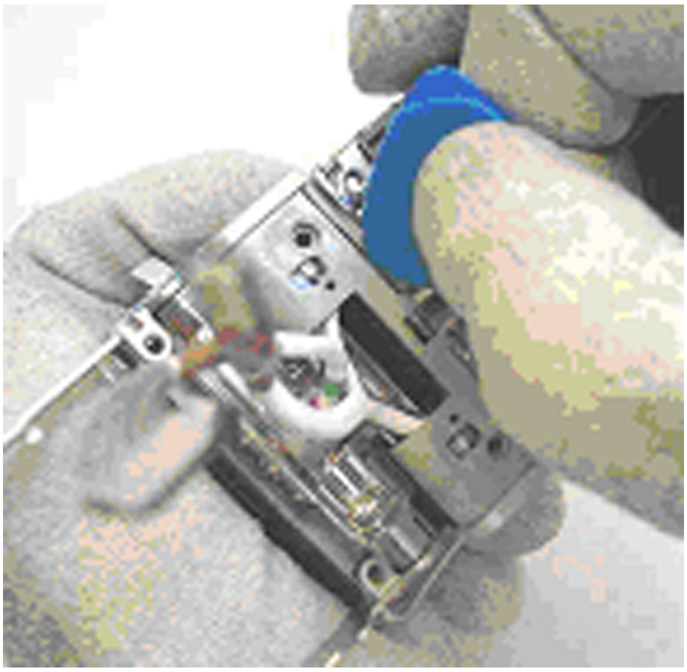
23. Remove **K2 connector** by using SRT-6. Handle **K2 display** gently, it can break easily. For assembly, reverse order, it is not necessary to wipe out adhesive from display frame.



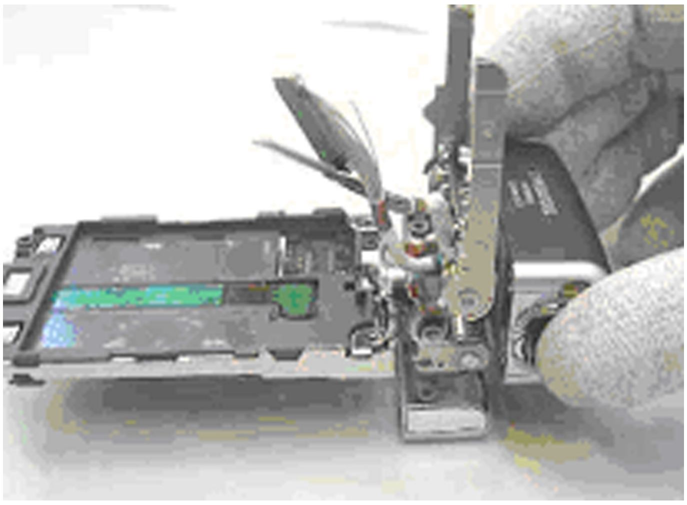
24. Unscrew the two Torx Plus size 6 screws.



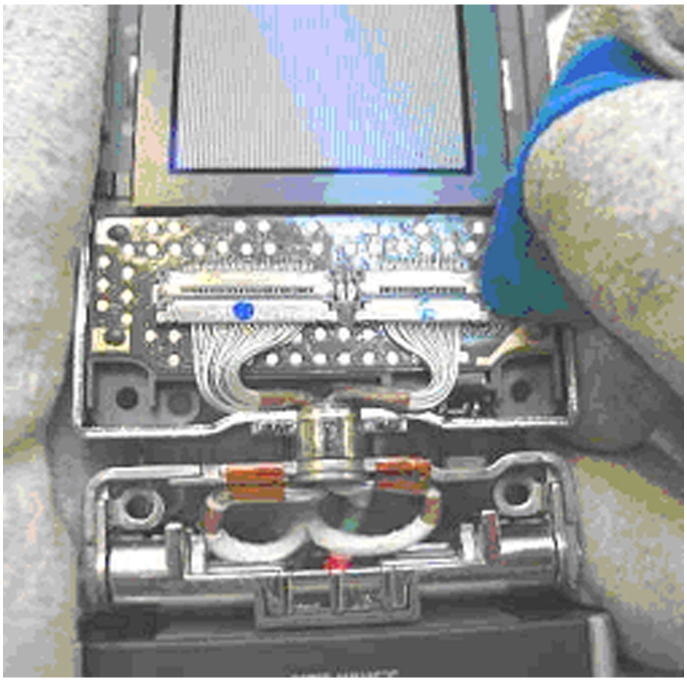
25. Remove **D-cover** by using SRT-6.



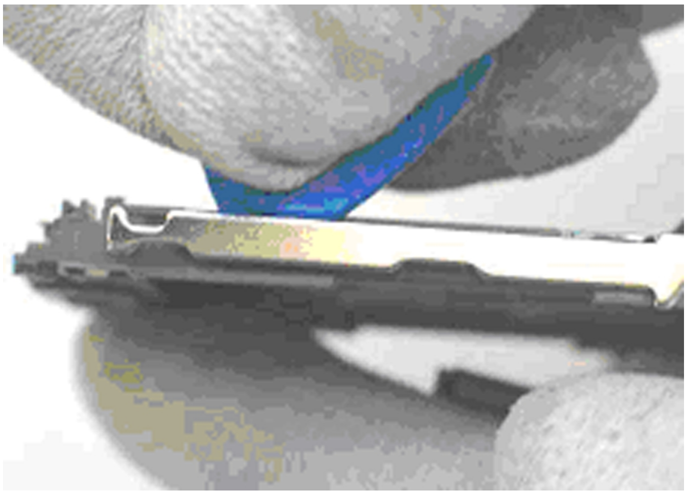
26. Remove **C-cover**.

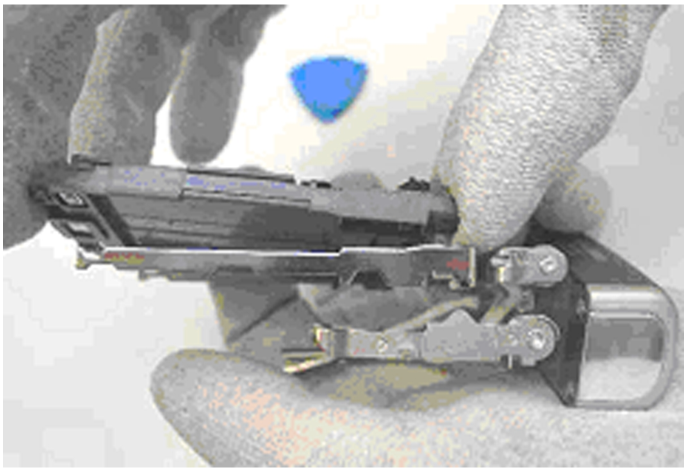


27. Open the micro coax connectors (2 pcs) of the **Display frame assembly** by using SRT-6 (tweezers).

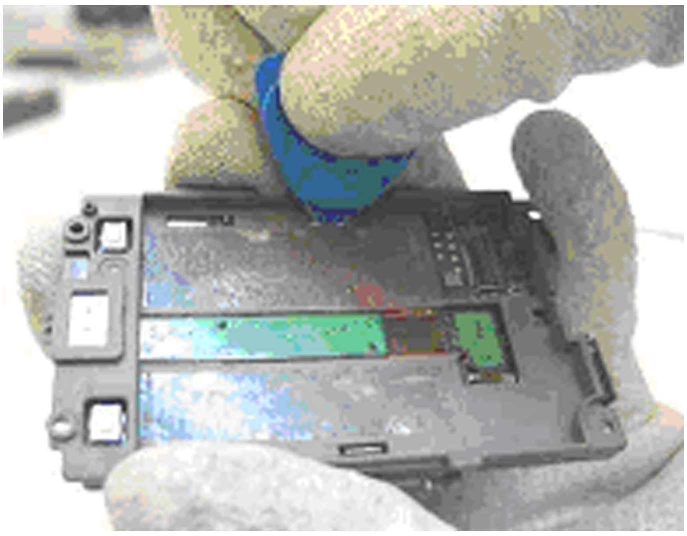


28. Remove hinge's bracket from the **Display Frame Assy**, Note not to bend brackets

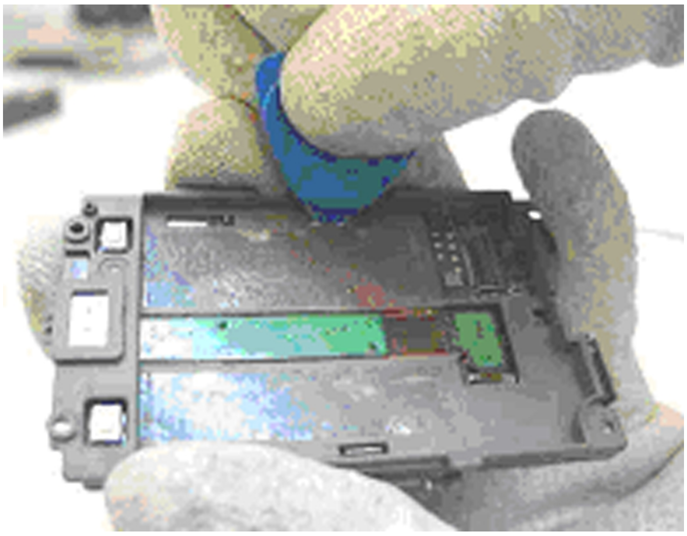




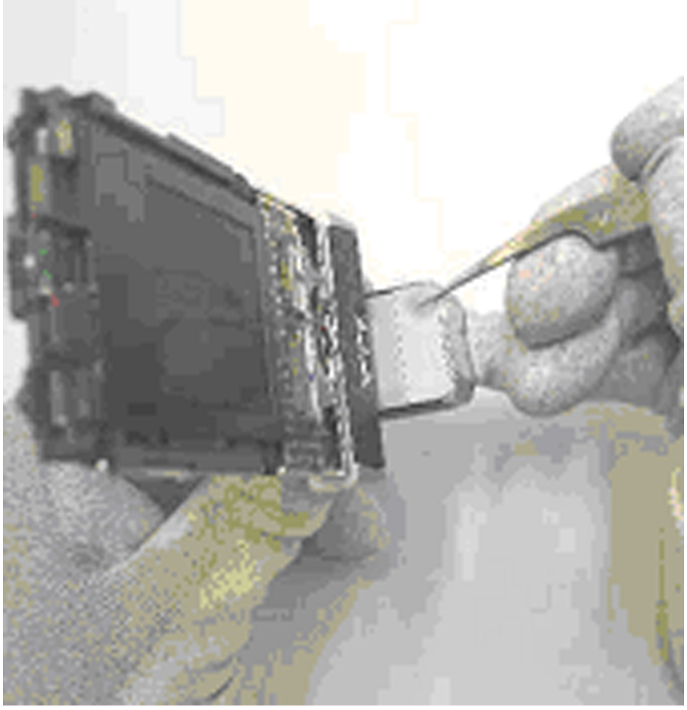
29. Remove **outer display (Jordan) shield** by opening locking snaps using tweezers (SRT-6).



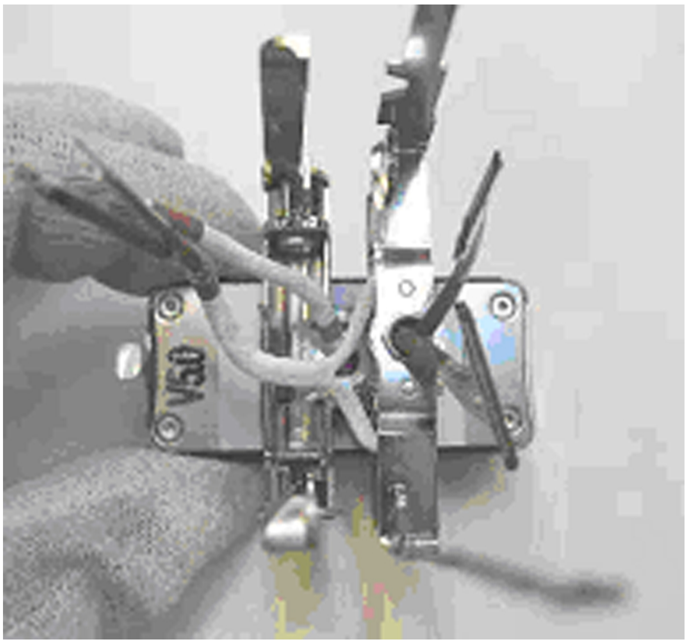
30. Open outer **Display connector** by using SRT-6.



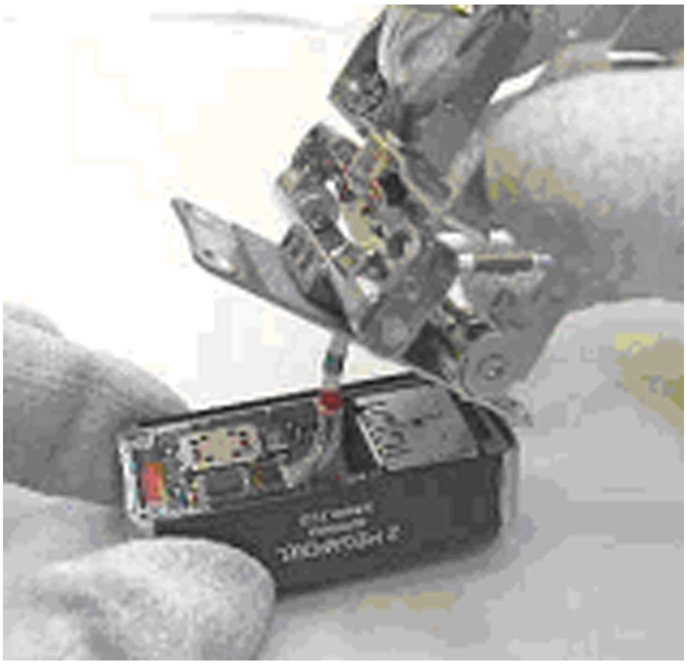
31. Turn camera unit 45 degrees and remove **Cosmetic layers** by using tweezers



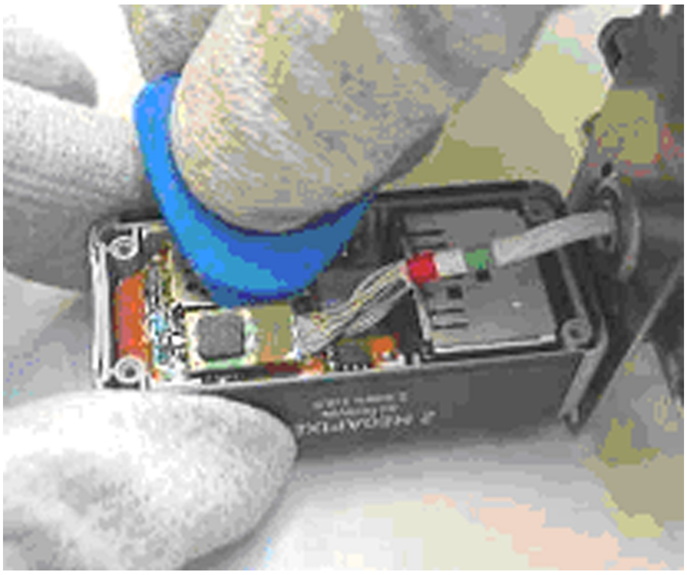
32. Unscrew the four Torx Plus size 5 screws.



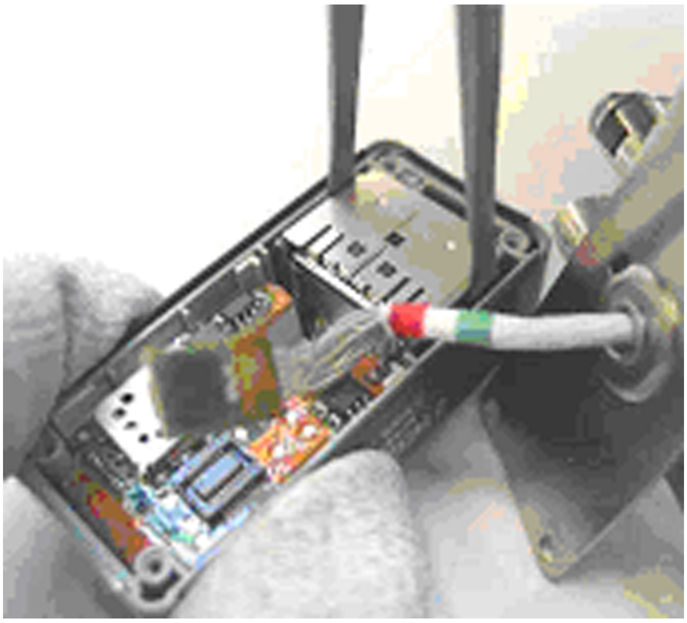
33. Lift **Hinge** out of **G-cover**.



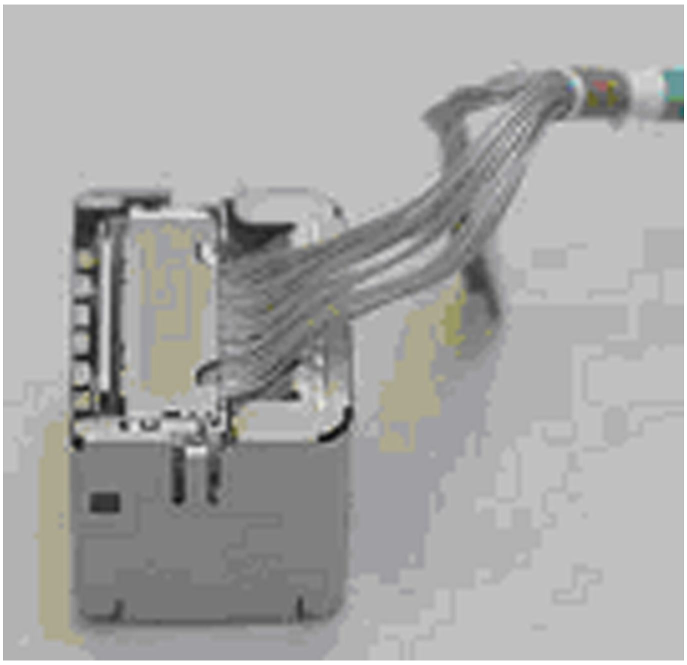
34. Open B-to-B connector by using SRT-6.



35. Lift **Camera Module** out of the **G-cover assy** by using tweezers or screwdriver.



36. Remove camera connector from camera using SS-57 (SS-57 instructions can be found from disassembly instructions of lower part).



6 — BB Troubleshooting and Manual Tuning Guide

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Baseband troubleshooting

Context

This section is intended to be a guide for localising and repairing electrical faults. The fault repairing is divided into troubleshooting paths.

The following main troubleshooting tree describes the different baseband troubleshooting paths to be followed in fault situations.

Troubleshooting flow

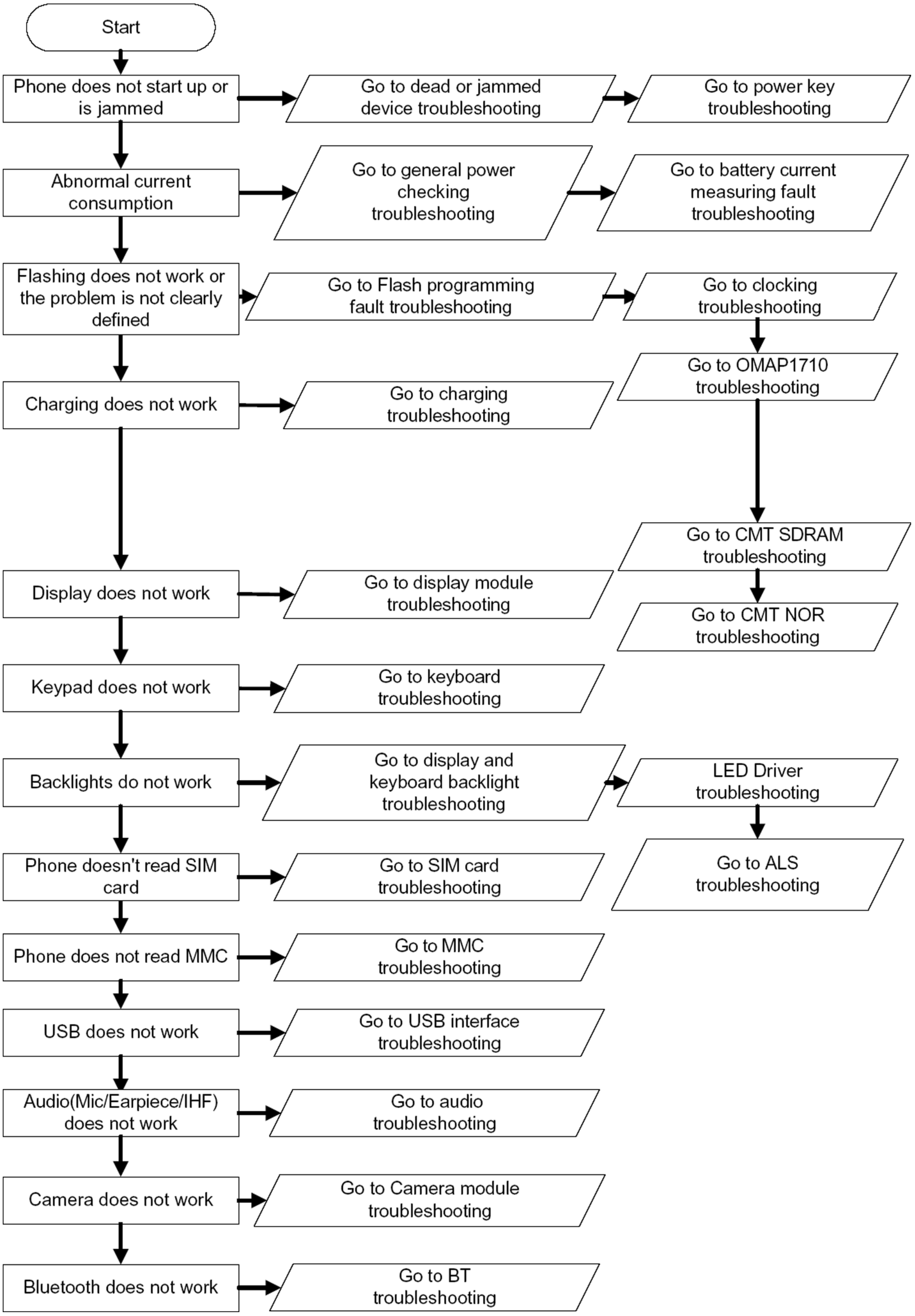
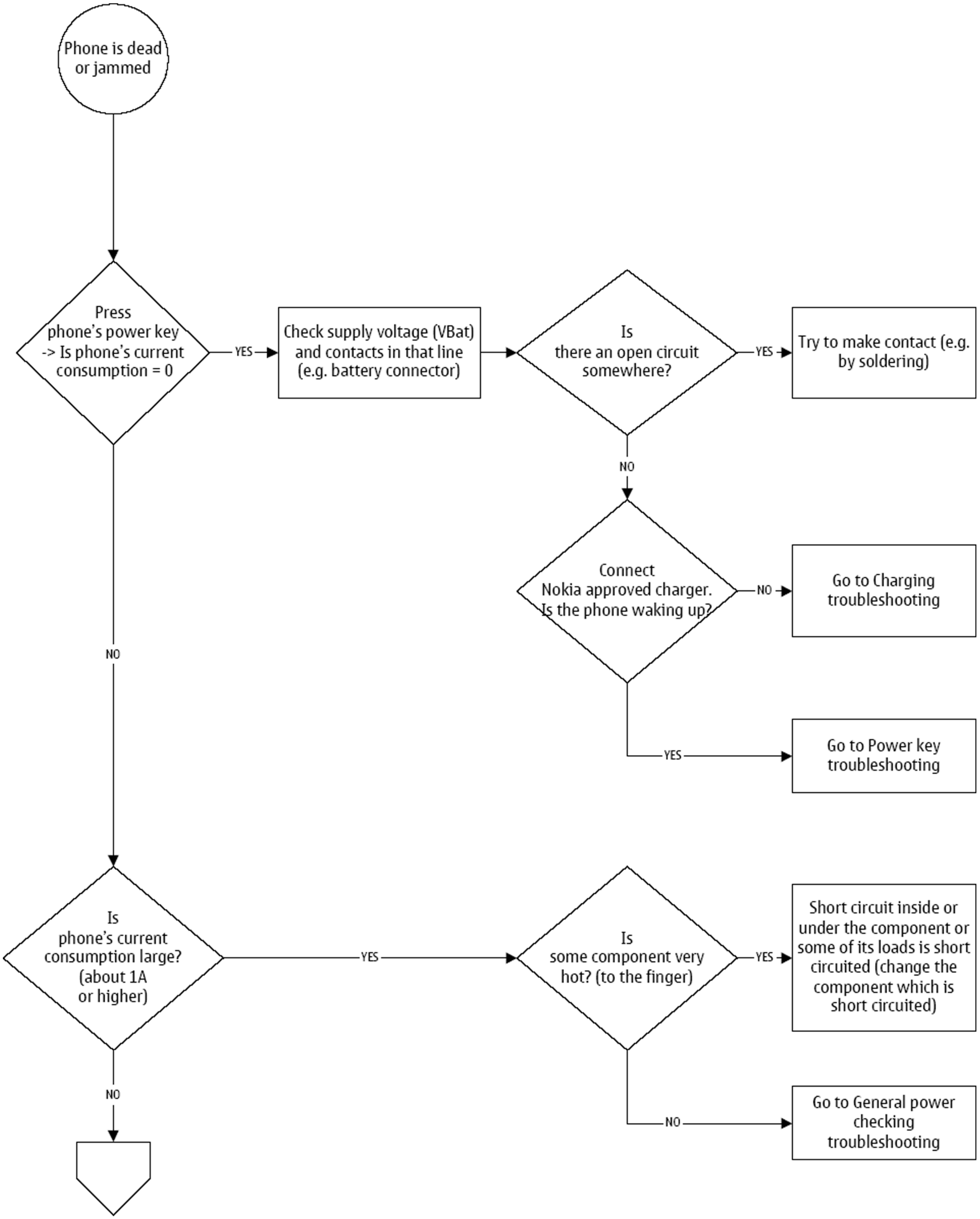
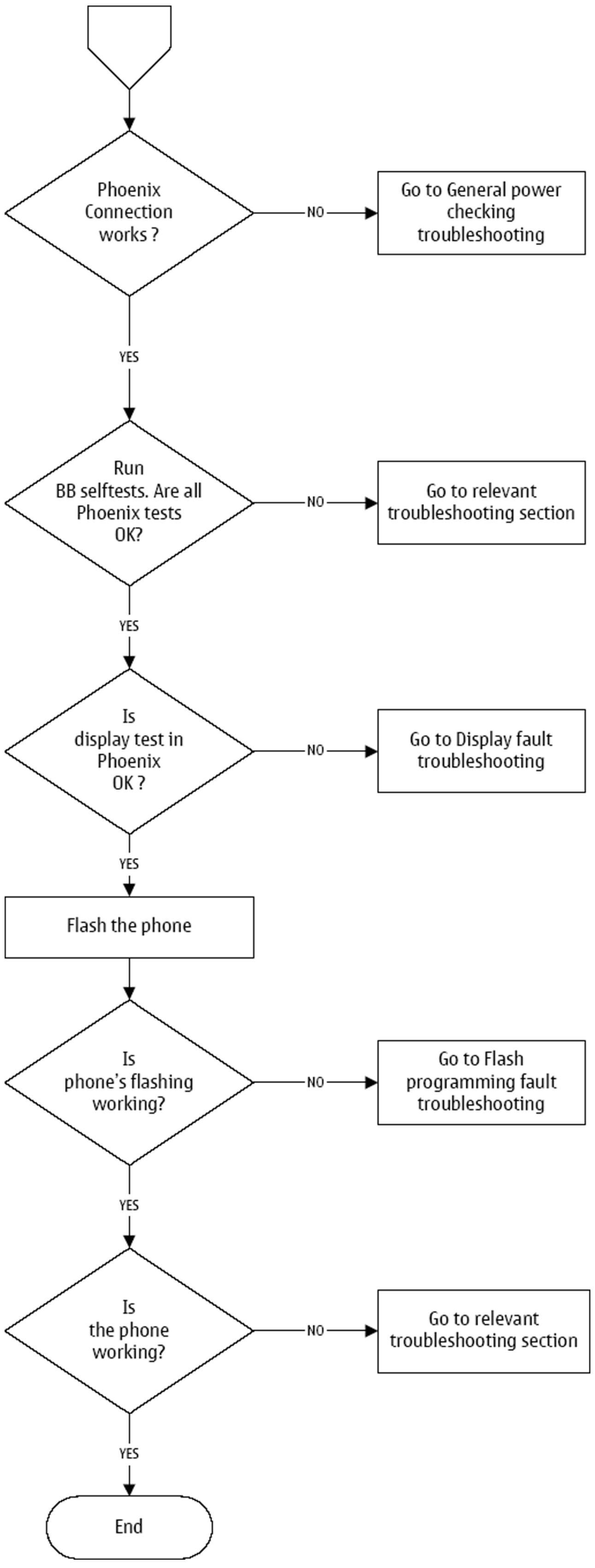

Start
Phone does not start up or is jammed
Go to dead or jammed device troubleshooting
Go to power key troubleshooting
Abnormal current consumption
Go to general power checking troubleshooting
Go to battery current measuring fault troubleshooting
Flashing does not work or the problem is not clearly defined
Go to Flash programming fault troubleshooting
Go to clocking troubleshooting
Go to OMAP1710 troubleshooting
Charging does not work
Go to charging troubleshooting
Go to CMT SDRAM troubleshooting
Go to CMT NOR troubleshooting
Display does not work
Go to display module troubleshooting
Keypad does not work
Go to keyboard troubleshooting
Backlights do not work
Go to display and keyboard backlight troubleshooting
LED Driver troubleshooting
Go to ALS troubleshooting
Phone doesn't read SIM card
Go to SIM card troubleshooting
Phone does not read MMC
Go to MMC troubleshooting
USB does not work
Go to USB interface troubleshooting
Audio(Mic/Earpiece/IHF) does not work
Go to audio troubleshooting
Camera does not work
Go to Camera module troubleshooting
Bluetooth does not work
Go to BT troubleshooting

Figure 37 Main troubleshooting tree

Dead or jammed device troubleshooting

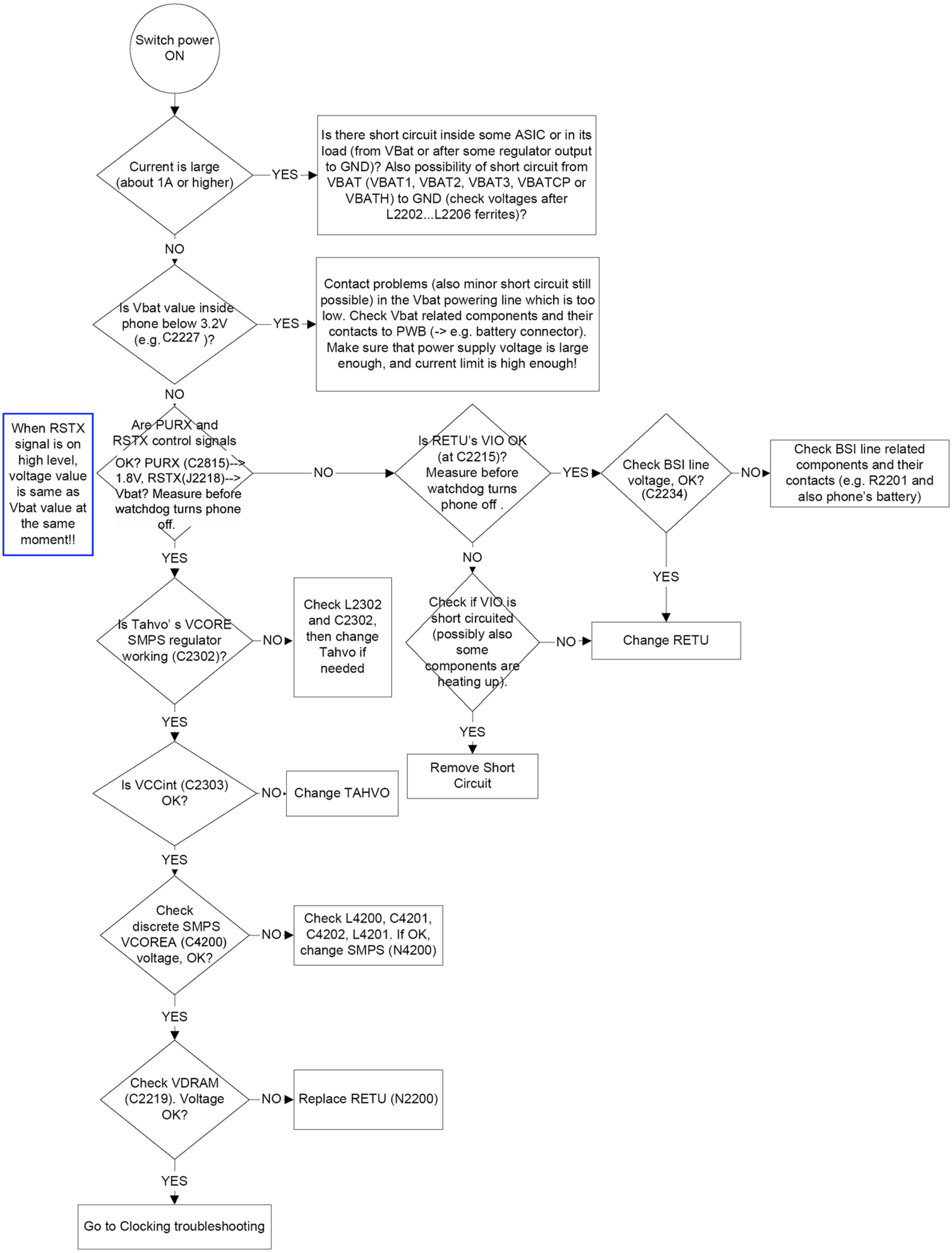
Troubleshooting flow


Phone is dead or jammed
Press phone's power key -> Is phone's current consumption = 0
YES
Check supply voltage (VBat) and contacts in that line (e.g. battery connector)
Is there an open circuit somewhere?
YES
Try to make contact (e.g. by soldering)
NO
Connect Nokia approved charger. Is the phone waking up?
NO
Go to Charging troubleshooting
YES
Go to Power key troubleshooting
NO
Is phone's current consumption large? (about 1A or higher)
YES
Is some component very hot? (to the finger)
YES
Short circuit inside or under the component or some of its loads is short circuited (change the component which is short circuited)
NO
Go to General power checking troubleshooting
NO


Phoenix Connection works ?
NO
Go to General power checking troubleshooting
YES
Run BB selftests. Are all Phoenix tests OK?
NO
Go to relevant troubleshooting section
YES
Is display test in Phoenix OK ?
NO
Go to Display fault troubleshooting
YES
Flash the phone
Is phone's flashing working?
NO
Go to Flash programming fault troubleshooting
YES
Is the phone working?
NO
Go to relevant troubleshooting section
YES
End

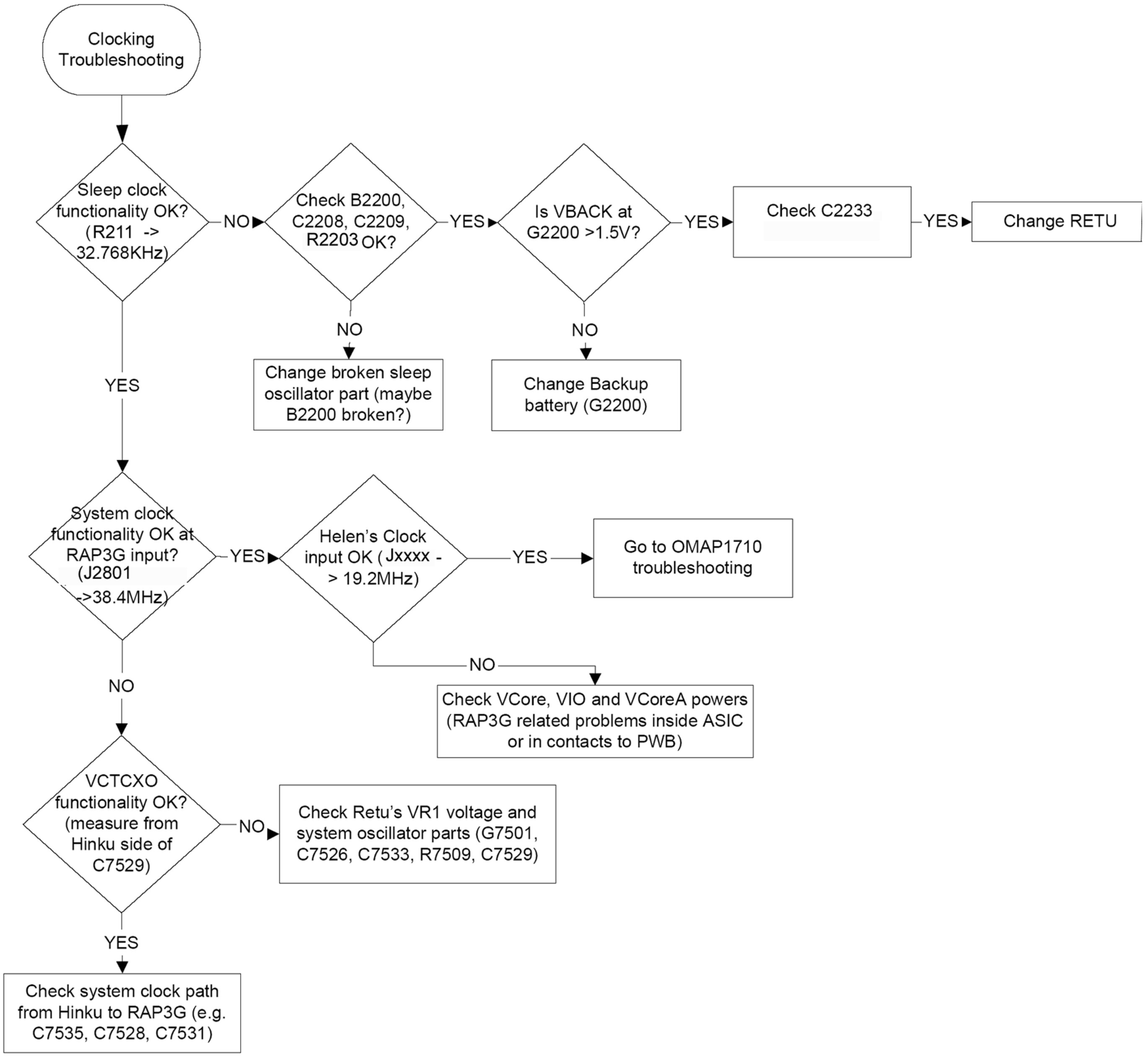
General power checking troubleshooting

Troubleshooting flow


Switch power ON
Current is large (about 1A or higher)
YES
Is there short circuit inside some ASIC or in its load (from VBat or after some regulator output to GND)? Also possibility of short circuit from VBAT (VBAT1, VBAT2, VBAT3, VBATCP or VBATH) to GND (check voltages after L2202...L2206 ferrites)?
NO
Is Vbat value inside phone below 3.2V (e.g. C2227)?
YES
Contact problems (also minor short circuit still possible) in the Vbat powering line which is too low. Check Vbat related components and their contacts to PWB (-> e.g. battery connector). Make sure that power supply voltage is large enough, and current limit is high enough!
NO
When RSTX signal is on high level, voltage value is same as Vbat value at the same moment!!
Are PURX and RSTX control signals OK? PURX (C2815)--> 1.8V, RSTX(J2218)--> Vbat? Measure before watchdog turns phone off.
NO
Is RETU's VIO OK (at C2215)? Measure before watchdog turns phone off .
YES
Check BSI line voltage, OK? (C2234)
NO
Check BSI line related components and their contacts (e.g. R2201 and also phone's battery)
YES
Change RETU
NO
Check if VIO is short circuited (possibly also some components are heating up).
NO
YES
Remove Short Circuit
YES
Is Tahvo' s VCORE SMPS regulator working (C2302)?
NO
Check L2302 and C2302, then change Tahvo if needed
YES
Is VCCint (C2303) OK?
NO
Change TAHVO
YES
Check discrete SMPS VCOREA (C4200) voltage, OK?
NO
Check L4200, C4201, C4202, L4201. If OK, change SMPS (N4200)
YES
Check VDRAM (C2219). Voltage OK?
NO
Replace RETU (N2200)
YES
Go to Clocking troubleshooting

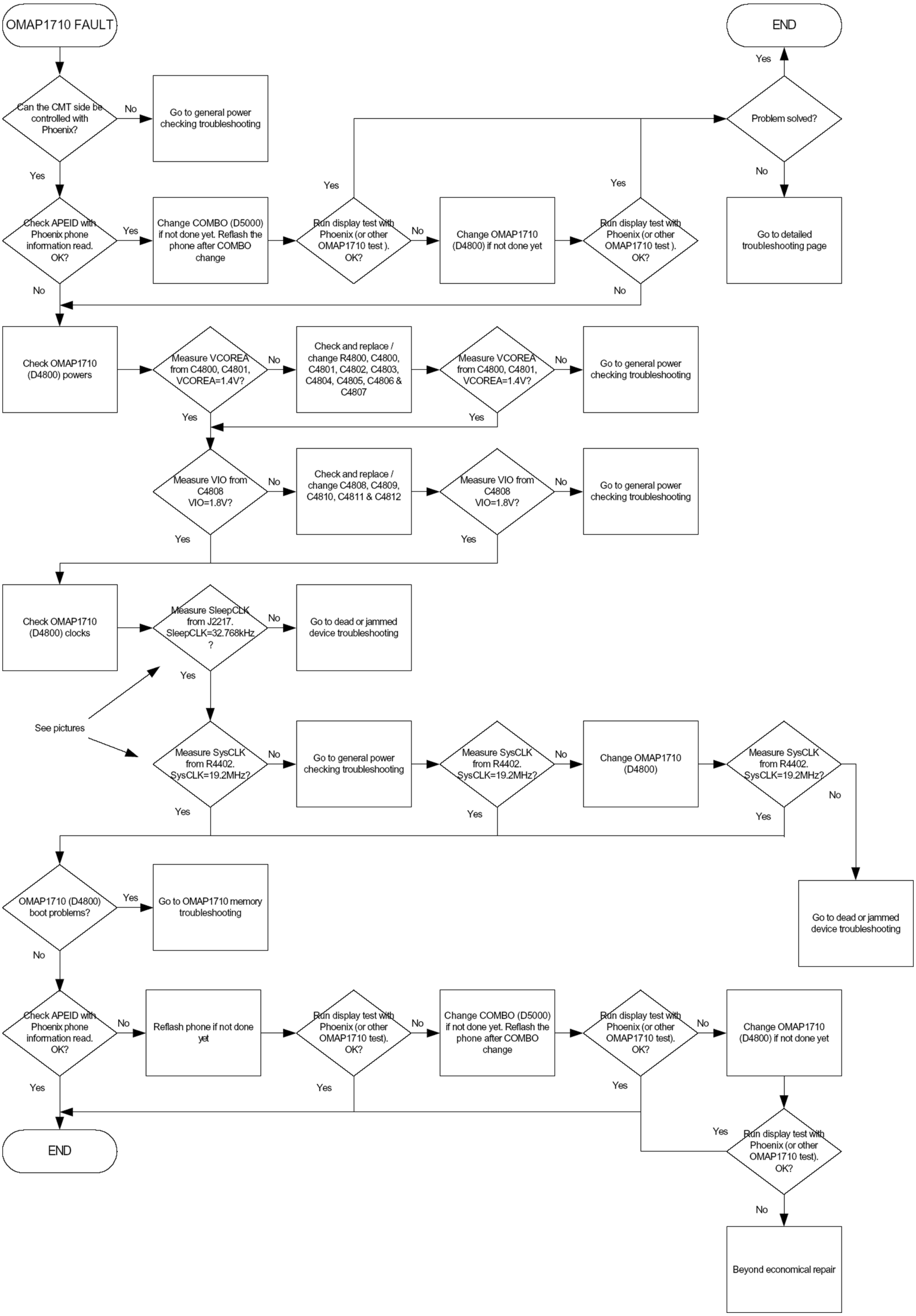
Clocking troubleshooting

Troubleshooting flow


Clocking Troubleshooting
Sleep clock functionality OK? (R211 -> 32.768KHz)
NO
Check B2200, C2208, C2209, R2203 OK?
YES
Is VBACK at G2200 >1.5V?
YES
Check C2233
YES
Change RETU
NO
Change broken sleep oscillator part (maybe B2200 broken?)
NO
Change Backup battery (G2200)
YES
System clock functionality OK at RAP3G input? (J2801 ->38.4MHz)
YES
Helen's Clock input OK (Jxxxx -> 19.2MHz)
YES
Go to OMAP1710 troubleshooting
NO
Check VCore, VIO and VCoreA powers (RAP3G related problems inside ASIC or in contacts to PWB)
NO
VCTCXO functionality OK? (measure from Hinku side of C7529)
NO
Check Retu's VR1 voltage and system oscillator parts (G7501, C7526, C7533, R7509, C7529)
YES
Check system clock path from Hinku to RAP3G (e.g. C7535, C7528, C7531)

OMAP1710 troubleshooting

Troubleshooting flow


OMAP1710 FAULT
Can the CMT side be controlled with Phoenix?
No
Go to general power checking troubleshooting
Yes
Check APEID with Phoenix phone information read. OK?
Yes
Change COMBO (D5000) if not done yet. Reflash the phone after COMBO change
Run display test with Phoenix (or other OMAP1710 test). OK?
Yes
No
Change OMAP1710 (D4800) if not done yet
Run display test with Phoenix (or other OMAP1710 test). OK?
Yes
No
END
Yes
Problem solved?
No
Go to detailed troubleshooting page
No
Check OMAP1710 (D4800) powers
Measure VCOREA from C4800, C4801, VCOREA=1.4V?
No
Check and replace / change R4800, C4800, C4801, C4802, C4803, C4804, C4805, C4806 & C4807
Measure VCOREA from C4800, C4801, VCOREA=1.4V?
No
Go to general power checking troubleshooting
Yes
Yes
Measure VIO from C4808 VIO=1.8V?
No
Check and replace / change C4808, C4809, C4810, C4811 & C4812
Measure VIO from C4808 VIO=1.8V?
No
Go to general power checking troubleshooting
Yes
Yes
Check OMAP1710 (D4800) clocks
Measure SleepCLK from J2217. SleepCLK=32.768kHz ?
No
Go to dead or jammed device troubleshooting
Yes
See pictures
Measure SysCLK from R4402. SysCLK=19.2MHz?
No
Go to general power checking troubleshooting
Measure SysCLK from R4402. SysCLK=19.2MHz?
No
Change OMAP1710 (D4800)
Measure SysCLK from R4402. SysCLK=19.2MHz?
No
Go to dead or jammed device troubleshooting
Yes
Yes
Yes
OMAP1710 (D4800) boot problems?
Yes
Go to OMAP1710 memory troubleshooting
No
Check APEID with Phoenix phone information read. OK?
No
Reflash phone if not done yet
Run display test with Phoenix (or other OMAP1710 test). OK?
No
Change COMBO (D5000) if not done yet. Reflash the phone after COMBO change
Run display test with Phoenix (or other OMAP1710 test). OK?
No
Change OMAP1710 (D4800) if not done yet
Yes
Yes
Yes
END
Yes
Run display test with Phoenix (or other OMAP1710 test). OK?
No
Beyond economical repair

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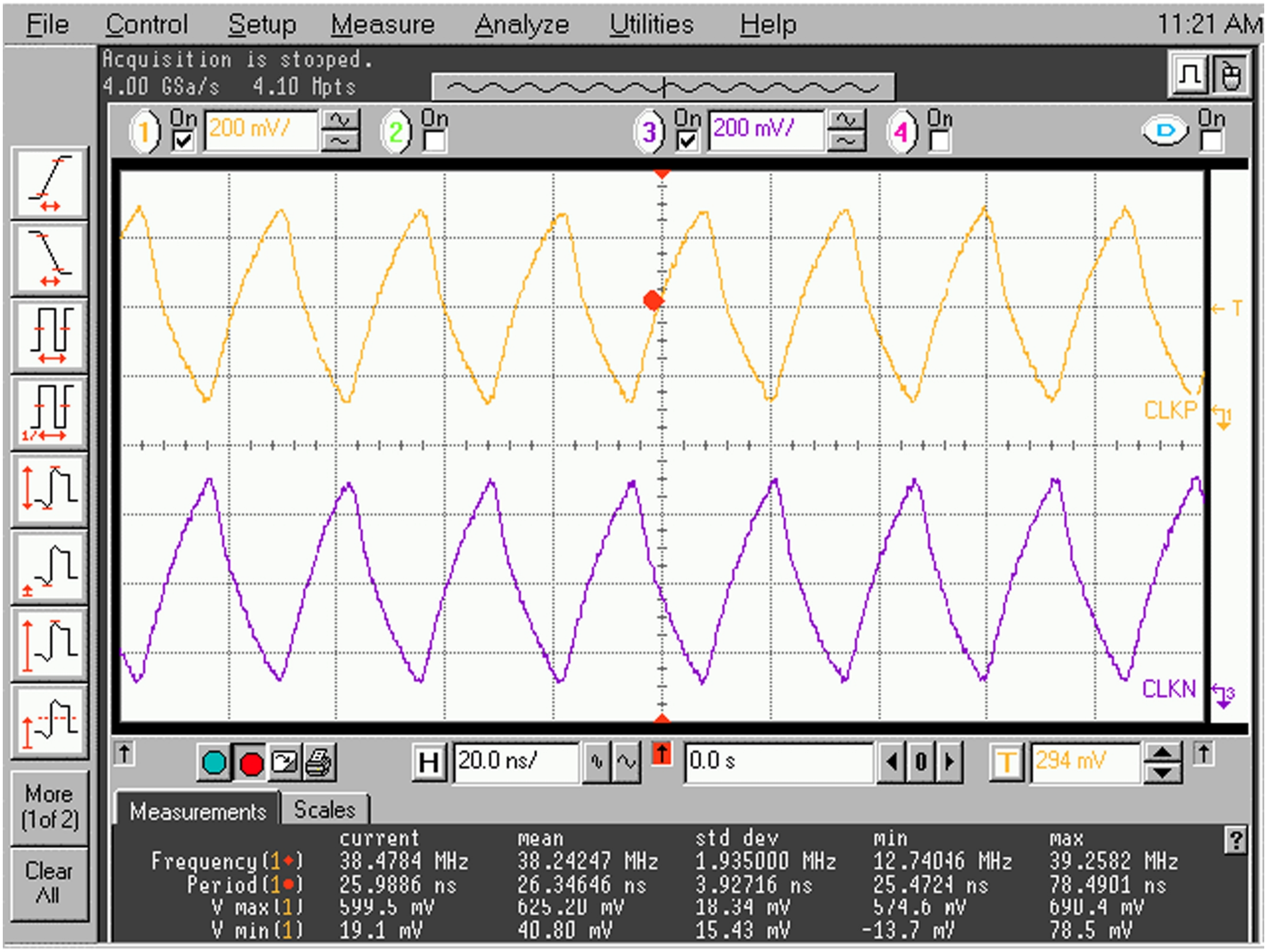
File
Control
Setup
Measure
Analyze
Utilities
Help
11:21 AM
1
On
200 mV/
2
On
3
On
200 mV/
4
On
On
T
CLKP
CLKN
More (1of 2)
Clear All
H
20.0 ns/
0.0 s
0
T
294 mV
Measurements
Scales
?

```
Acquisition is stopped.
4.00 GSa/s    4.10 Mpts
```

```
                 current         mean            std dev         min             max
Frequency(1◆)    38.4784 MHz     38.24247 MHz    1.935000 MHz    12.74046 MHz    39.2582 MHz
   Period(1●)    25.9886 ns      26.34646 ns     3.92716 ns      25.4724 ns      78.4901 ns
      V max(1)   599.5 mV        625.20 mV       18.34 mV        574.6 mV        690.4 mV
      V min(1)   19.1 mV         40.80 mV        15.43 mV       -13.7 mV         78.5 mV
```

Figure 38 SYSCLK from J2801

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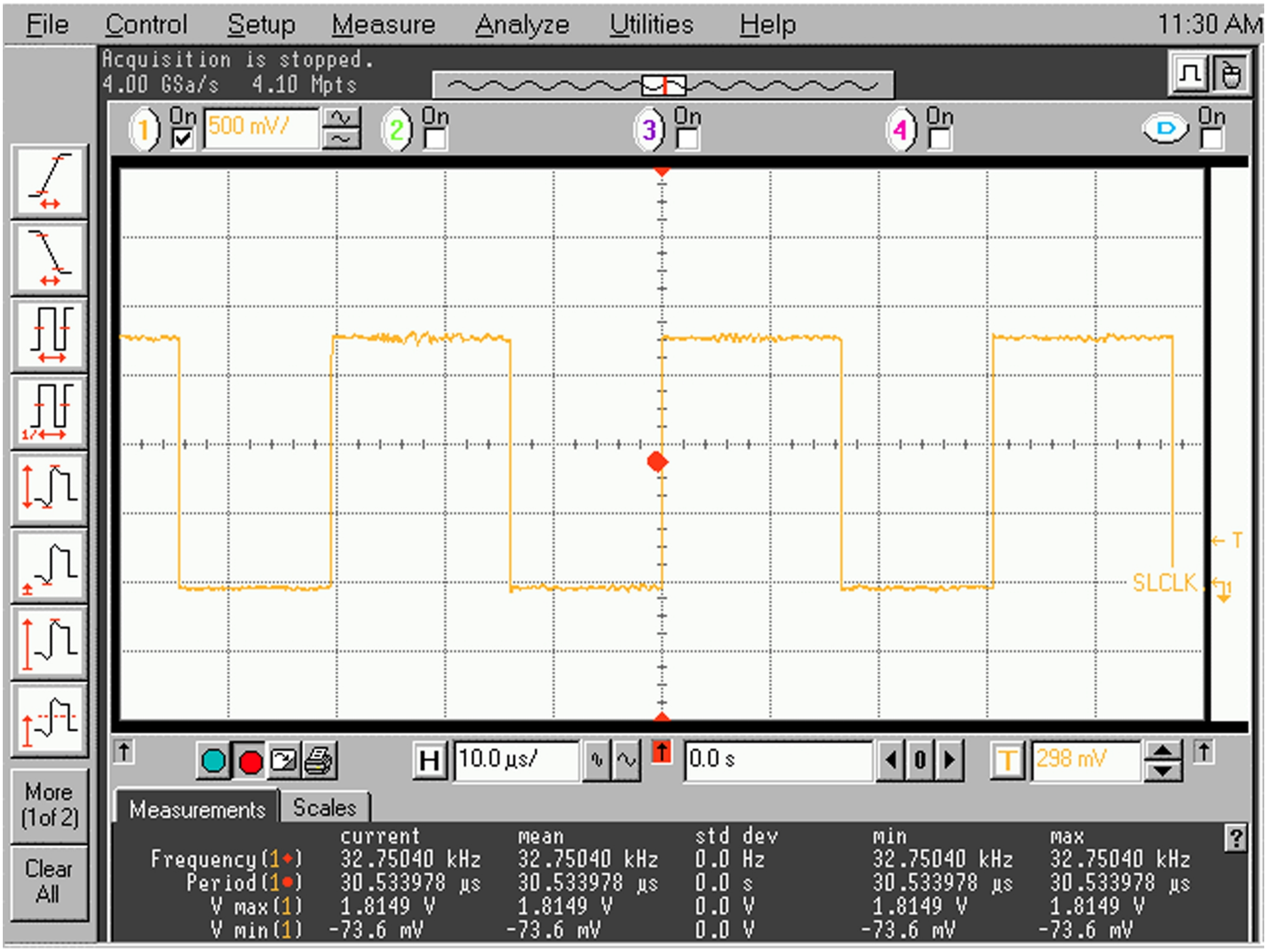

File
Control
Setup
Measure
Analyze
Utilities
Help
11:30 AM
1 On ☑ 500 mV/
2 On ☐
3 On ☐
4 On ☐
D On ☐
T
SLCLK
More (1of 2)
Clear All
H 10.0 µs/
0.0 s
T 298 mV
Measurements
Scales

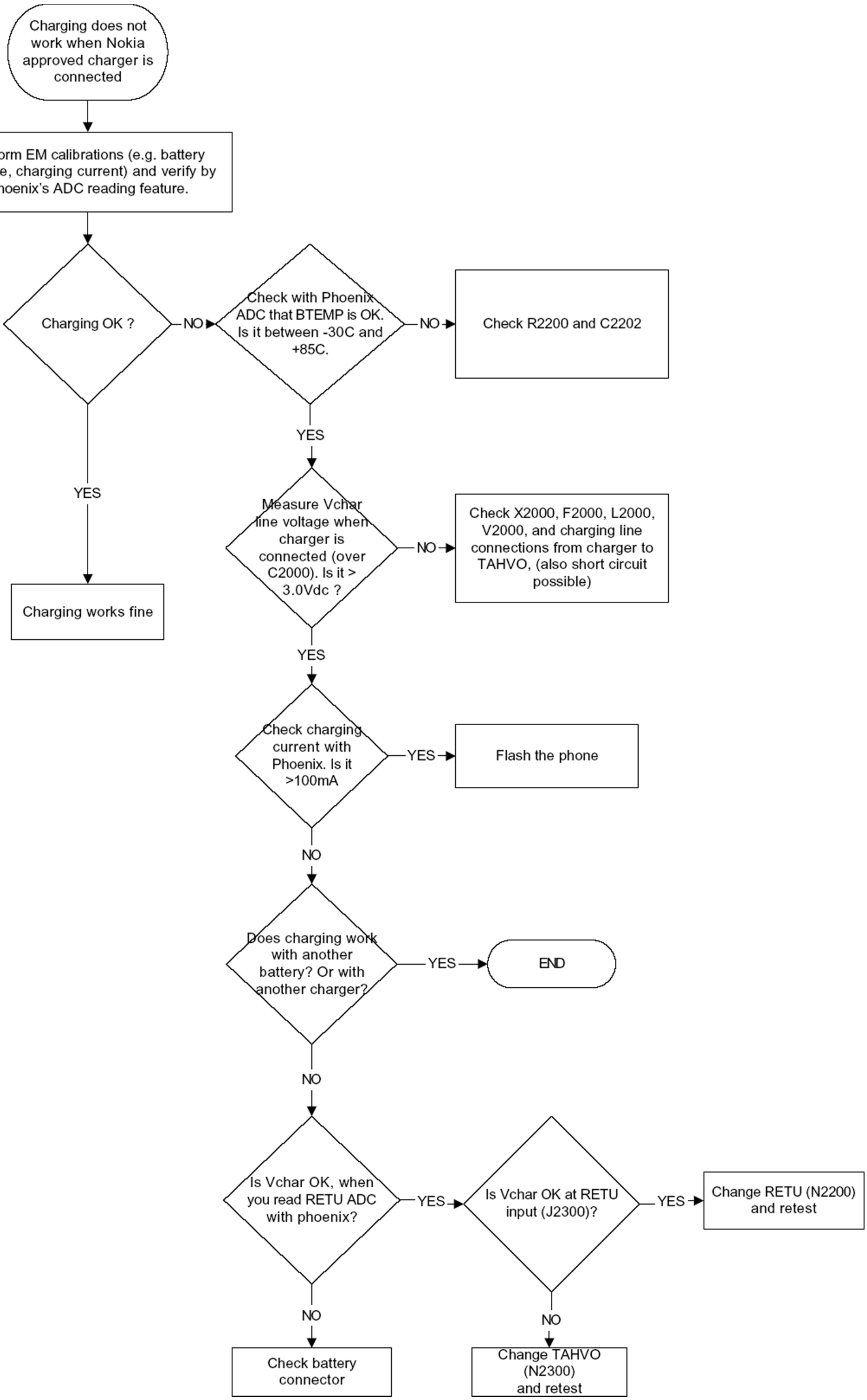
```
Acquisition is stopped.
4.00 GSa/s    4.10 Mpts
```

```
               current         mean            std dev    min             max
Frequency(1•)  32.75040 kHz    32.75040 kHz    0.0 Hz     32.75040 kHz    32.75040 kHz
   Period(1•)  30.533978 µs    30.533978 µs    0.0 s      30.533978 µs    30.533978 µs
    V max(1)   1.8149 V        1.8149 V        0.0 V      1.8149 V        1.8149 V
    V min(1)  -73.6 mV        -73.6 mV         0.0 V     -73.6 mV        -73.6 mV
```

Figure 39 SleepCLK from R211

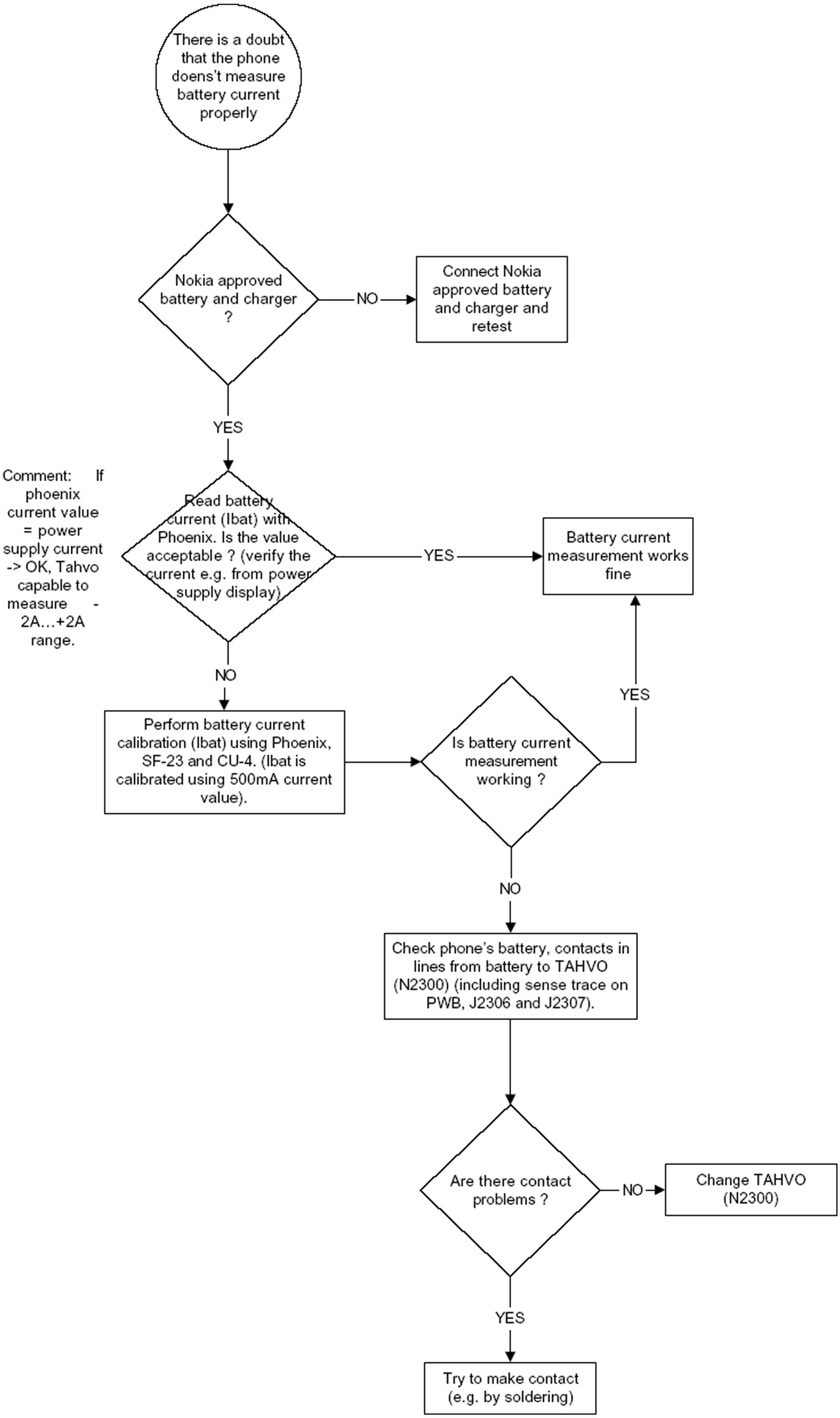
Charging troubleshooting

Troubleshooting flow


Charging does not work when Nokia approved charger is connected
Perform EM calibrations (e.g. battery voltage, charging current) and verify by Phoenix's ADC reading feature.
Charging OK ?
NO
Check with Phoenix ADC that BTEMP is OK. Is it between -30C and +85C.
NO
Check R2200 and C2202
YES
Charging works fine
YES
Measure Vchar line voltage when charger is connected (over C2000). Is it > 3.0Vdc ?
NO
Check X2000, F2000, L2000, V2000, and charging line connections from charger to TAHVO, (also short circuit possible)
YES
Check charging current with Phoenix. Is it >100mA
YES
Flash the phone
NO
Does charging work with another battery? Or with another charger?
YES
END
NO
Is Vchar OK, when you read RETU ADC with phoenix?
YES
Is Vchar OK at RETU input (J2300)?
YES
Change RETU (N2200) and retest
NO
Check battery connector
NO
Change TAHVO (N2300) and retest

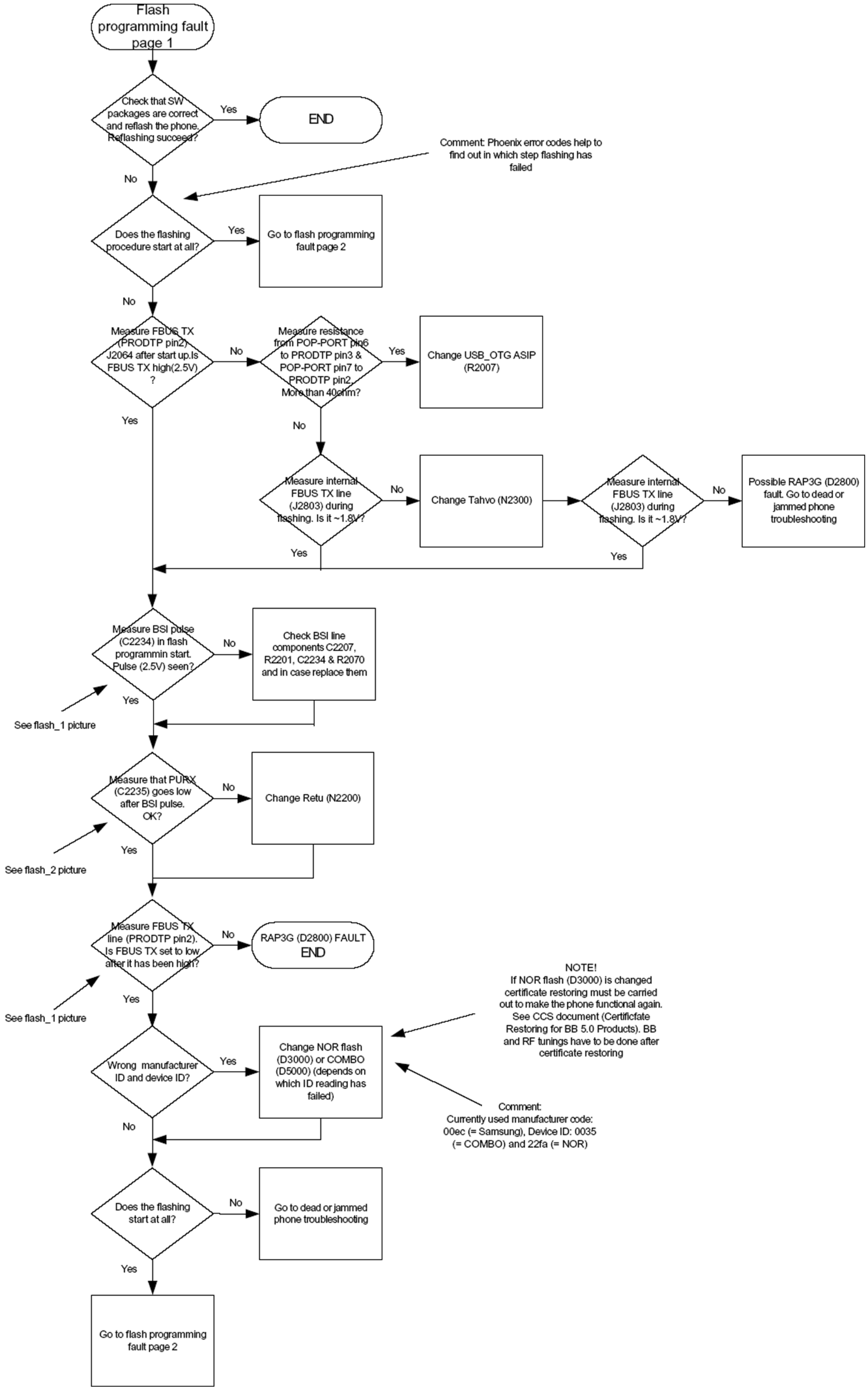
Battery current measuring fault troubleshooting

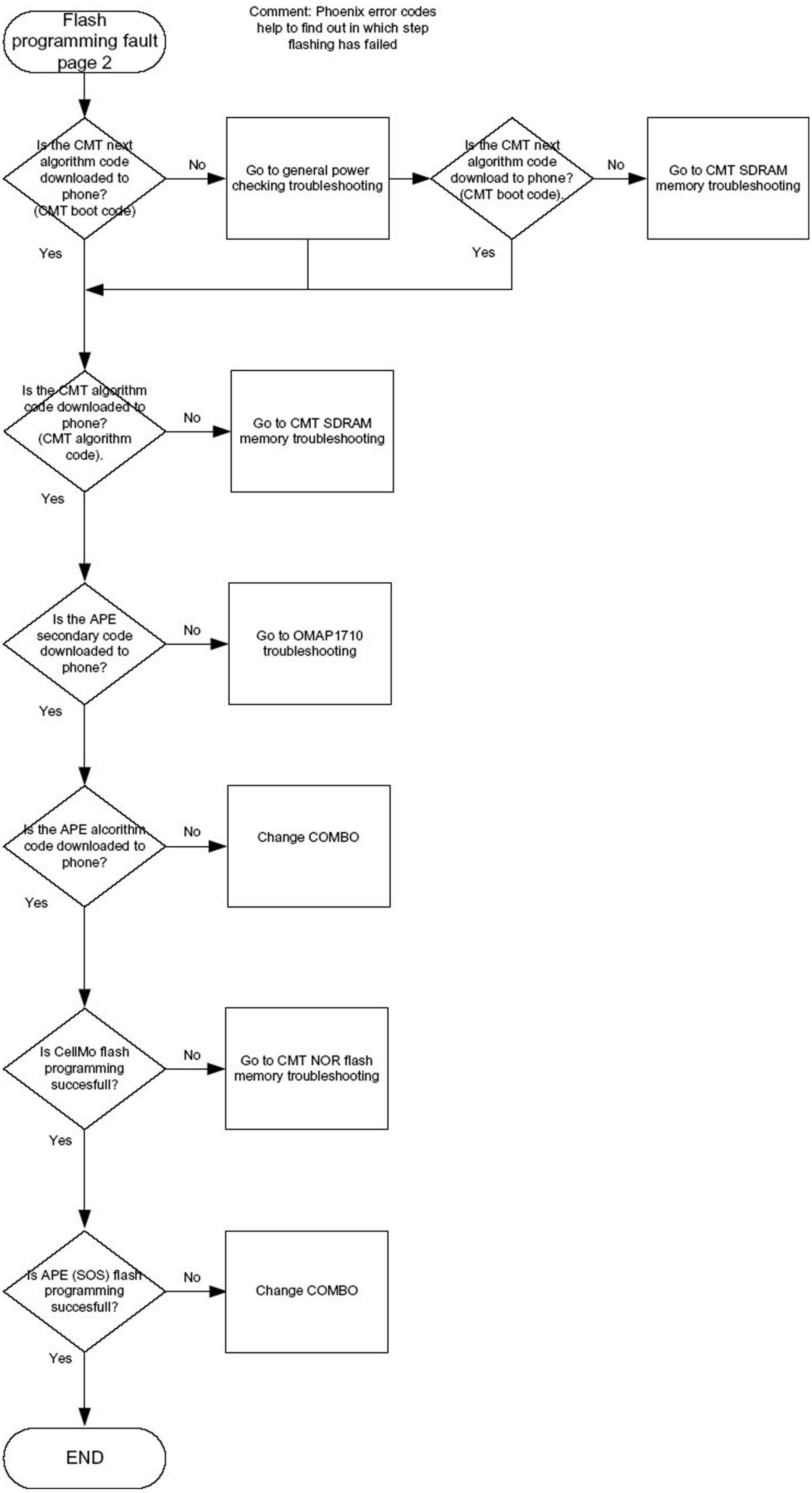
Troubleshooting flow

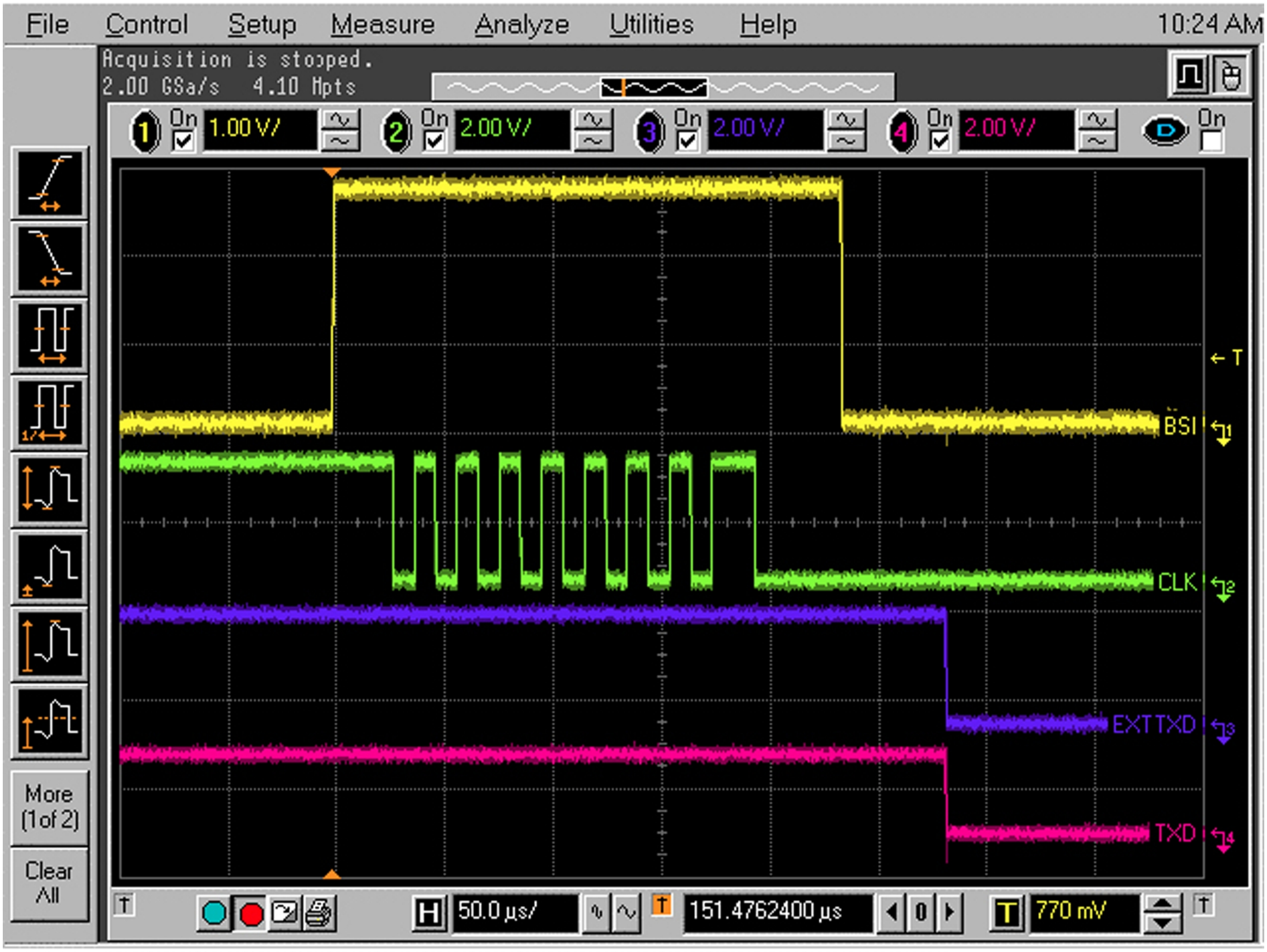

There is a doubt that the phone doens't measure battery current properly
Nokia approved battery and charger ?
NO
Connect Nokia approved battery and charger and retest
YES
Comment: If phoenix current value = power supply current -> OK, Tahvo capable to measure -2A...+2A range.
Read battery current (Ibat) with Phoenix. Is the value acceptable ? (verify the current e.g. from power supply display)
YES
Battery current measurement works fine
NO
Perform battery current calibration (Ibat) using Phoenix, SF-23 and CU-4. (Ibat is calibrated using 500mA current value).
Is battery current measurement working ?
YES
NO
Check phone's battery, contacts in lines from battery to TAHVO (N2300) (including sense trace on PWB, J2306 and J2307).
Are there contact problems ?
NO
Change TAHVO (N2300)
YES
Try to make contact (e.g. by soldering)

Flash programming fault troubleshooting

Troubleshooting flow


Flash programming fault page 1
Check that SW packages are correct and reflash the phone. Reflashing succeed?
Yes
END
No
Comment: Phoenix error codes help to find out in which step flashing has failed
Does the flashing procedure start at all?
Yes
Go to flash programming fault page 2
No
Measure FBUS TX (PRODTP pin2) J2064 after start up.Is FBUS TX high(2.5V) ?
No
Measure resistance from POP-PORT pin6 to PRODTP pin3 & POP-PORT pin7 to PRODTP pin2. More than 40ohm?
Yes
Change USB_OTG ASIP (R2007)
No
Measure internal FBUS TX line (J2803) during flashing. Is it ~1.8V?
No
Change Tahvo (N2300)
Measure internal FBUS TX line (J2803) during flashing. Is it ~1.8V?
No
Possible RAP3G (D2800) fault. Go to dead or jammed phone troubleshooting
Yes
Yes
Yes
Measure BSI pulse (C2234) in flash programmin start. Pulse (2.5V) seen?
No
Check BSI line components C2207, R2201, C2234 & R2070 and in case replace them
Yes
See flash_1 picture
Measure that PURX (C2235) goes low after BSI pulse. OK?
No
Change Retu (N2200)
Yes
See flash_2 picture
Measure FBUS TX line (PRODTP pin2). Is FBUS TX set to low after it has been high?
No
RAP3G (D2800) FAULT END
Yes
See flash_1 picture
NOTE! If NOR flash (D3000) is changed certificate restoring must be carried out to make the phone functional again. See CCS document (Certificate Restoring for BB 5.0 Products). BB and RF tunings have to be done after certificate restoring
Wrong manufacturer ID and device ID?
Yes
Change NOR flash (D3000) or COMBO (D5000) (depends on which ID reading has failed)
Comment: Currently used manufacturer code: 00ec (= Samsung), Device ID: 0035 (= COMBO) and 22fa (= NOR)
No
Does the flashing start at all?
No
Go to dead or jammed phone troubleshooting
Yes
Go to flash programming fault page 2


Flash programming fault page 2
Comment: Phoenix error codes help to find out in which step flashing has failed
Is the CMT next algorithm code downloaded to phone? (CMT boot code)
No
Go to general power checking troubleshooting
Is the CMT next algorithm code download to phone? (CMT boot code).
No
Go to CMT SDRAM memory troubleshooting
Yes
Yes
Is the CMT algorithm code downloaded to phone? (CMT algorithm code).
No
Go to CMT SDRAM memory troubleshooting
Yes
Is the APE secondary code downloaded to phone?
No
Go to OMAP1710 troubleshooting
Yes
Is the APE alcorithm code downloaded to phone?
No
Change COMBO
Yes
Is CellMo flash programming succesfull?
No
Go to CMT NOR flash memory troubleshooting
Yes
Is APE (SOS) flash programming succesfull?
No
Change COMBO
Yes
END


Acquisition is stopped.
2.00 GSa/s 4.10 Mpts

File
Control
Setup
Measure
Analyze
Utilities
Help
10:24 AM
1 On 1.00 V/
2 On 2.00 V/
3 On 2.00 V/
4 On 2.00 V/
On
More (1 of 2)
Clear All
T
BSI
CLK
EXTTXD
TXD
H 50.0 µs/
151.4762400 µs
0
T 770 mV

Figure 40 Flashing pic 1. Take single trig measurement for the rise of the BSI signal.

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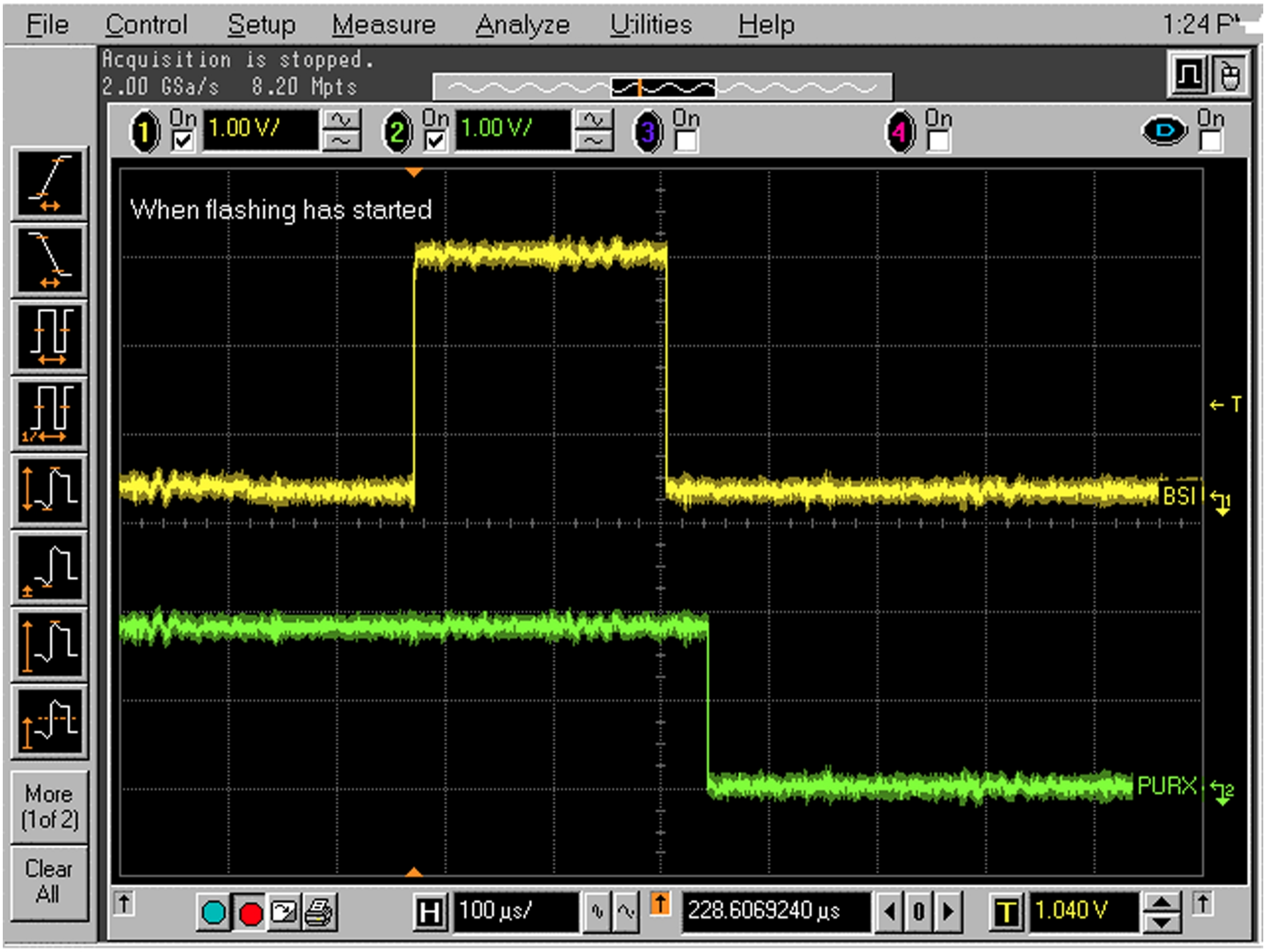


Acquisition is stopped.
2.00 GSa/s 8.20 Mpts

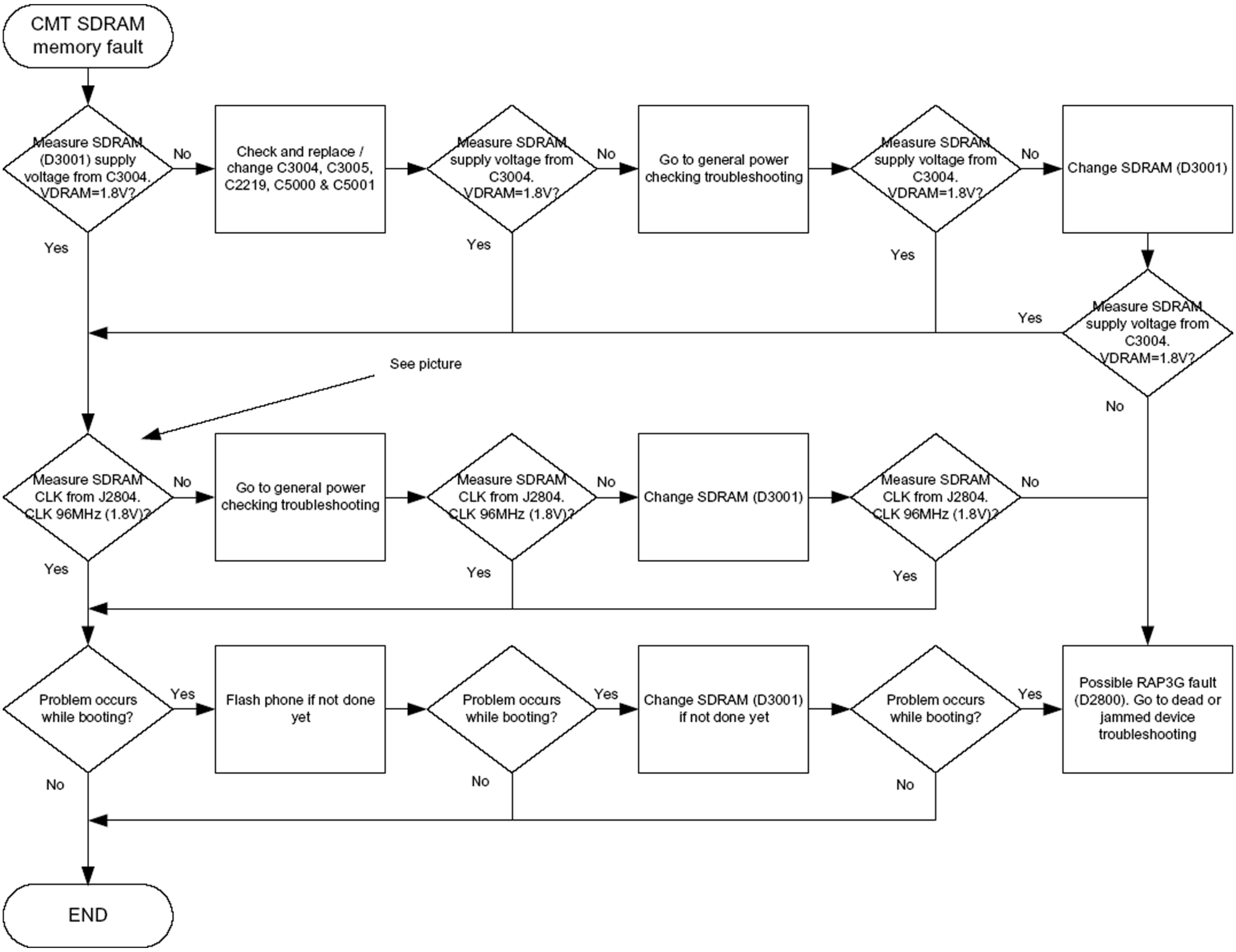
When flashing has started

File
Control
Setup
Measure
Analyze
Utilities
Help
1:24 P
1
On
1.00 V/
2
On
1.00 V/
3
On
4
On
D
On
← T
BSI
PURX
More
(1 of 2)
Clear
All
H
100 µs/
228.6069240 µs
0
T
1.040 V

Figure 41 Flashing pic 2. Take single trig measurement for the rise of the BSI signal.

CMT SDRAM memory troubleshooting

Troubleshooting flow


CMT SDRAM memory fault
Measure SDRAM (D3001) supply voltage from C3004. VDRAM=1.8V?
No
Check and replace / change C3004, C3005, C2219, C5000 & C5001
Measure SDRAM supply voltage from C3004. VDRAM=1.8V?
No
Go to general power checking troubleshooting
Measure SDRAM supply voltage from C3004. VDRAM=1.8V?
No
Change SDRAM (D3001)
Yes
Yes
Yes
Measure SDRAM supply voltage from C3004. VDRAM=1.8V?
Yes
No
See picture
Measure SDRAM CLK from J2804. CLK 96MHz (1.8V)?
No
Go to general power checking troubleshooting
Measure SDRAM CLK from J2804. CLK 96MHz (1.8V)?
No
Change SDRAM (D3001)
Measure SDRAM CLK from J2804. CLK 96MHz (1.8V)?
No
Yes
Yes
Yes
Problem occurs while booting?
Yes
Flash phone if not done yet
Problem occurs while booting?
Yes
Change SDRAM (D3001) if not done yet
Problem occurs while booting?
Yes
Possible RAP3G fault (D2800). Go to dead or jammed device troubleshooting
No
No
No
END

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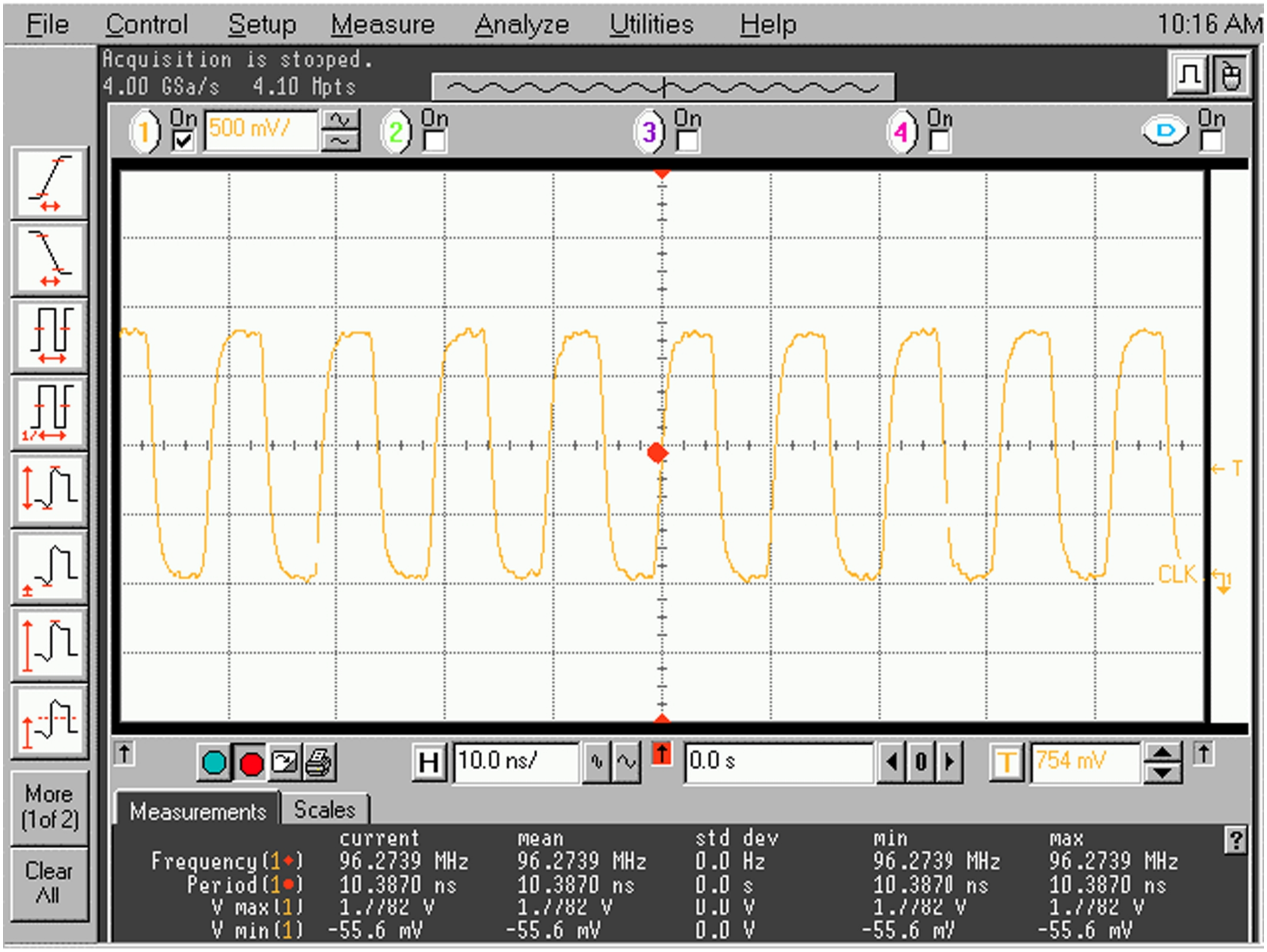

File
Control
Setup
Measure
Analyze
Utilities
Help
10:16 AM
1
On
500 mV/
2
On
3
On
4
On
D
On
T
CLK
More (1of 2)
Clear All
H
Measurements
Scales

```
Acquisition is stopped.
4.00 GSa/s    4.10 Mpts
```

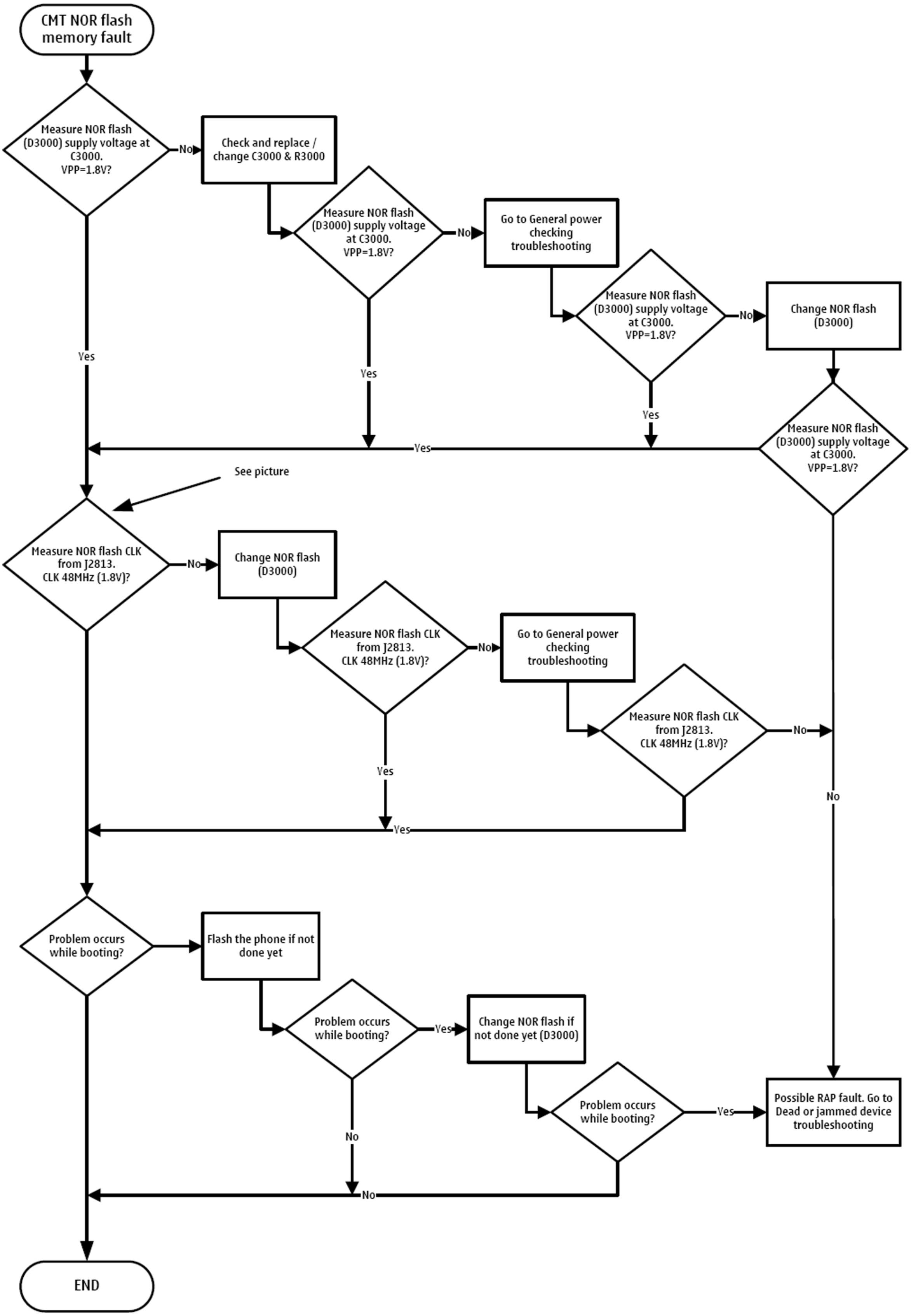
Channel 1: ☑ On, 500 mV/ — Horizontal: 10.0 ns/ — Delay: 0.0 s — Trigger: 754 mV

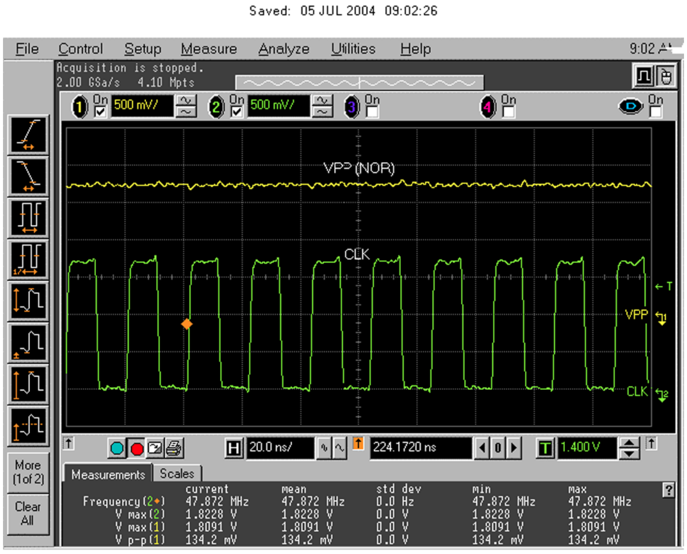
```
                 current        mean           std dev     min            max
Frequency(1)   96.2739 MHz    96.2739 MHz    0.0 Hz      96.2739 MHz    96.2739 MHz
   Period(1)   10.3870 ns     10.3870 ns     0.0 s       10.3870 ns     10.3870 ns
    V max(1)   1.7782 V       1.7782 V       0.0 V       1.7782 V       1.7782 V
    V min(1)  -55.6 mV       -55.6 mV        0.0 V      -55.6 mV       -55.6 mV
```

Figure 42 CMT SDRAM CLK from pin J2804

CMT NOR flash fault troubleshooting

Troubleshooting flow


CMT NOR flash memory fault
Measure NOR flash (D3000) supply voltage at C3000. VPP=1.8V?
No
Check and replace / change C3000 & R3000
Measure NOR flash (D3000) supply voltage at C3000. VPP=1.8V?
No
Go to General power checking troubleshooting
Measure NOR flash (D3000) supply voltage at C3000. VPP=1.8V?
No
Change NOR flash (D3000)
Measure NOR flash (D3000) supply voltage at C3000. VPP=1.8V?
Yes
Yes
Yes
Yes
See picture
Measure NOR flash CLK from J2813. CLK 48MHz (1.8V)?
No
Change NOR flash (D3000)
Measure NOR flash CLK from J2813. CLK 48MHz (1.8V)?
No
Go to General power checking troubleshooting
Measure NOR flash CLK from J2813. CLK 48MHz (1.8V)?
No
No
Yes
Yes
Problem occurs while booting?
Flash the phone if not done yet
Problem occurs while booting?
Yes
Change NOR flash if not done yet (D3000)
Problem occurs while booting?
Yes
Possible RAP fault. Go to Dead or jammed device troubleshooting
No
No
END



Saved: 05 JUL 2004 09:02:26

```
Acquisition is stopped.
2.00 GSa/s   4.10 Mpts
```

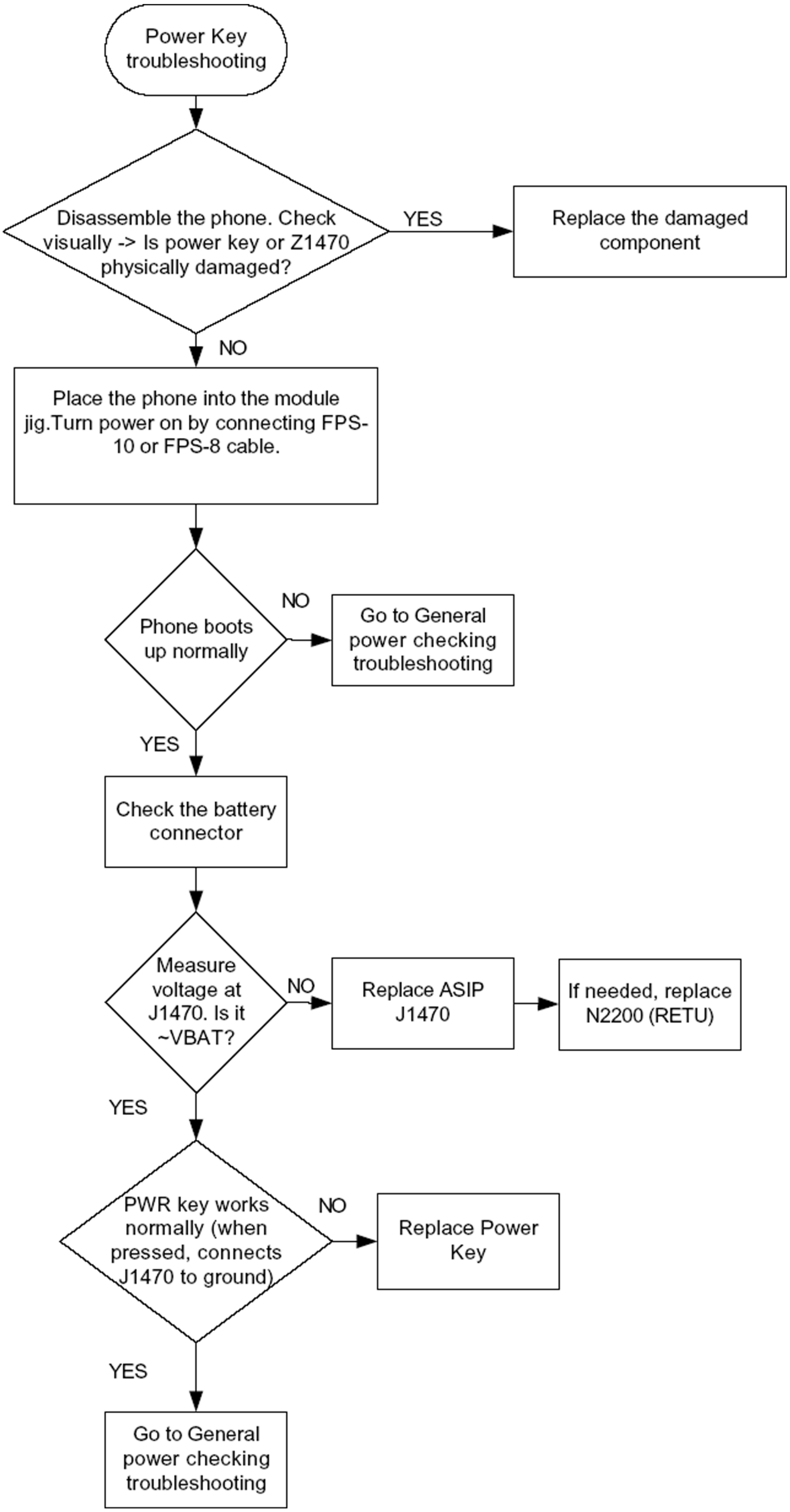
File
Control
Setup
Measure
Analyze
Utilities
Help
9:02 AM
1
On
500 mV/
2
On
500 mV/
3
On
4
On
On
VPP (NOR)
CLK
T
VPP
CLK
More (1of 2)
Clear All
H
20.0 ns/
224.1720 ns
0
T
1.400 V
Measurements
Scales
?

```
                  current      mean         std dev      min          max
  Frequency(2♦)   47.872 MHz   47.872 MHz   0.0 Hz       47.872 MHz   47.872 MHz
      V max(2)    1.8228 V     1.8228 V     0.0 V        1.8228 V     1.8228 V
      V max(1)    1.8091 V     1.8091 V     0.0 V        1.8091 V     1.8091 V
      V p-p(1)    134.2 mV     134.2 mV     0.0 V        134.2 mV     134.2 mV
```

Figure 43 NOR CLK from J2813

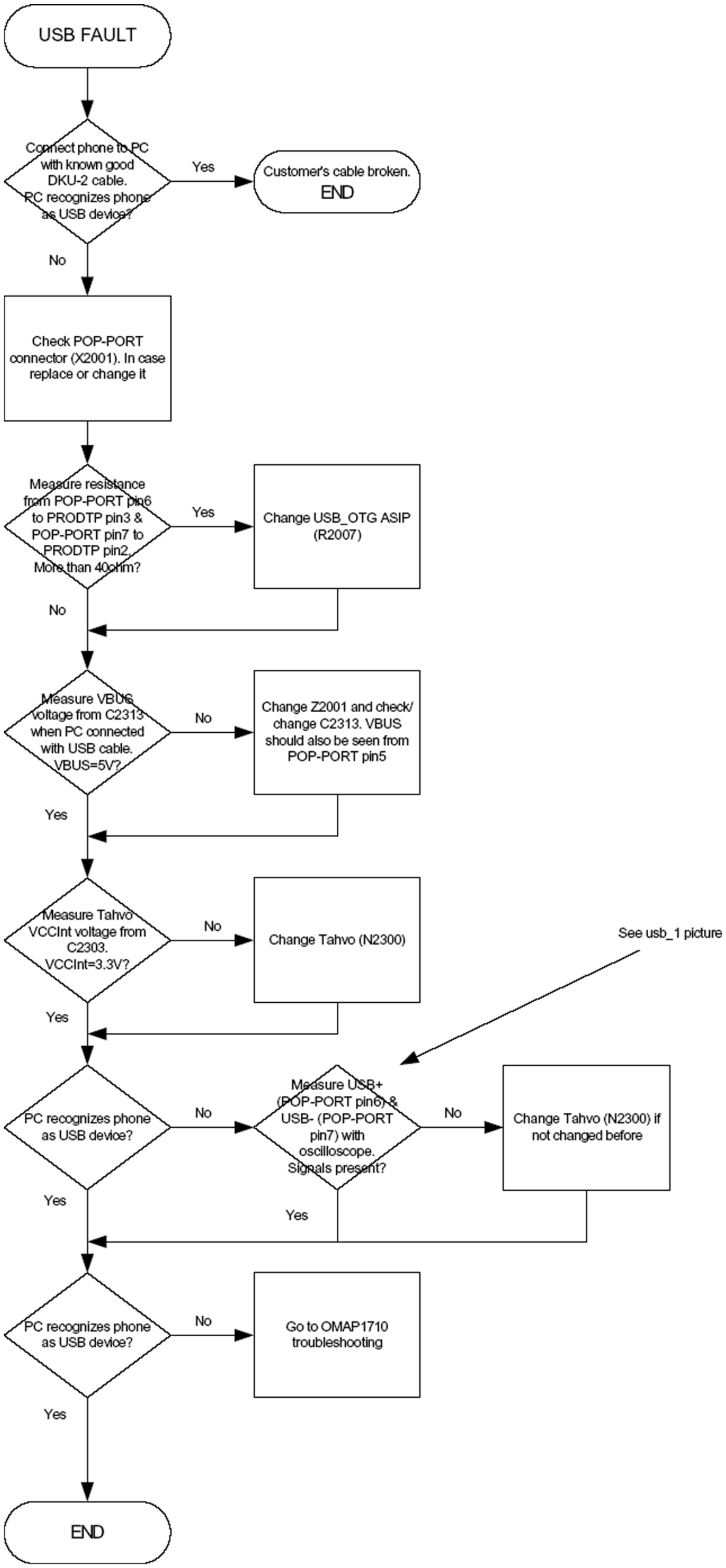
Power key troubleshooting

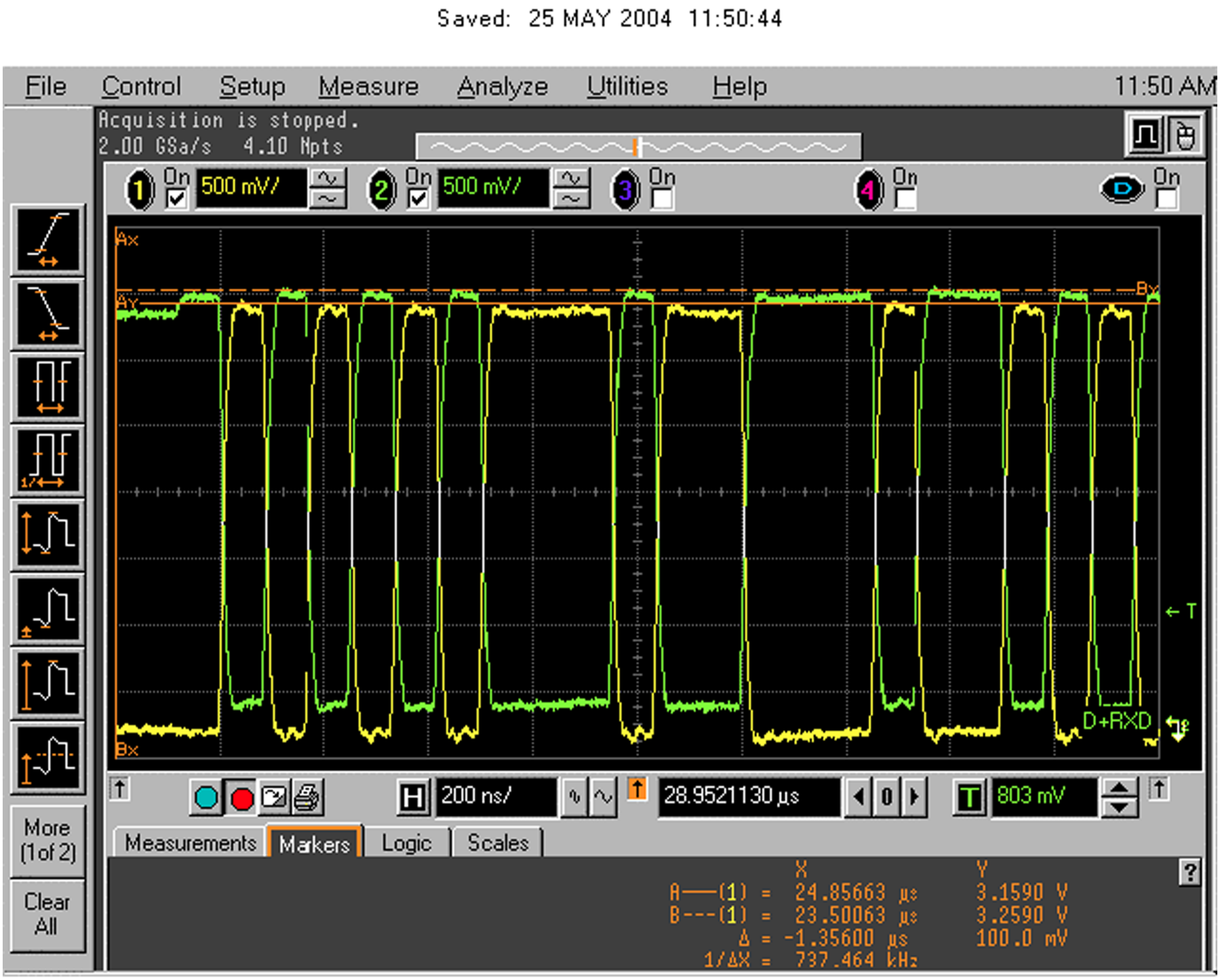
Troubleshooting flow


Power Key troubleshooting
Disassemble the phone. Check visually -> Is power key or Z1470 physically damaged?
YES
Replace the damaged component
NO
Place the phone into the module jig.Turn power on by connecting FPS-10 or FPS-8 cable.
Phone boots up normally
NO
Go to General power checking troubleshooting
YES
Check the battery connector
Measure voltage at J1470. Is it ~VBAT?
NO
Replace ASIP J1470
If needed, replace N2200 (RETU)
YES
PWR key works normally (when pressed, connects J1470 to ground)
NO
Replace Power Key
YES
Go to General power checking troubleshooting

USB interface troubleshooting

Troubleshooting flow


USB FAULT
Connect phone to PC with known good DKU-2 cable. PC recognizes phone as USB device?
Yes
Customer's cable broken. END
No
Check POP-PORT connector (X2001). In case replace or change it
Measure resistance from POP-PORT pin6 to PRODTP pin3 & POP-PORT pin7 to PRODTP pin2. More than 4Ohm?
Yes
Change USB_OTG ASIP (R2007)
No
Measure VBUS voltage from C2313 when PC connected with USB cable. VBUS=5V?
No
Change Z2001 and check/ change C2313. VBUS should also be seen from POP-PORT pin5
Yes
Measure Tahvo VCCInt voltage from C2303. VCCInt=3.3V?
No
Change Tahvo (N2300)
Yes
See usb_1 picture
PC recognizes phone as USB device?
No
Measure USB+ (POP-PORT pin6) & USB- (POP-PORT pin7) with oscilloscope. Signals present?
No
Change Tahvo (N2300) if not changed before
Yes
Yes
PC recognizes phone as USB device?
No
Go to OMAP1710 troubleshooting
Yes
END



```
Saved:  25 MAY 2004  11:50:44
```

```
Acquisition is stopped.
2.00 GSa/s    4.10 Mpts
```

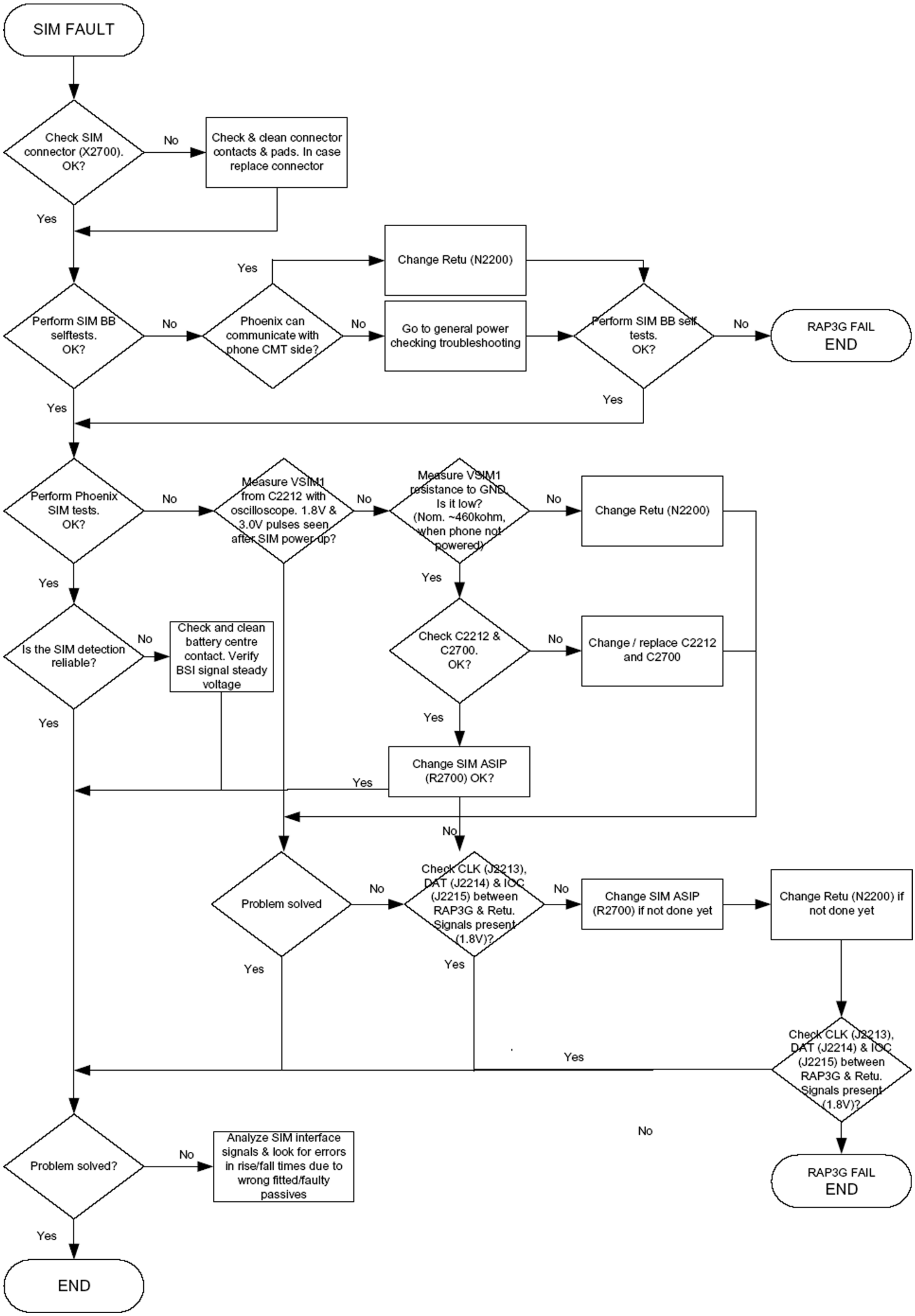
```
                     X                  Y
A——(1) =  24.85663 µs        3.1590 V
B---(1) =  23.50063 µs        3.2590 V
      Δ = -1.35600 µs        100.0 mV
   1/ΔX =  737.464 kHz
```

File
Control
Setup
Measure
Analyze
Utilities
Help
11:50 AM
1 On ☑ 500 mV/
2 On ☑ 500 mV/
3 On ☐
4 On ☐
D On ☐
Ax
Ay
Bx
By
← T
D+RXD
More (1 of 2)
Clear All
H 200 ns/
28.9521130 µs
0
T 803 mV
Measurements
Markers
Logic
Scales
?

Figure 44 USB 1: D-TXD (POP-PORT pin6) and D+RXD (POP-PORT pin7) voltage levels when USB connected.

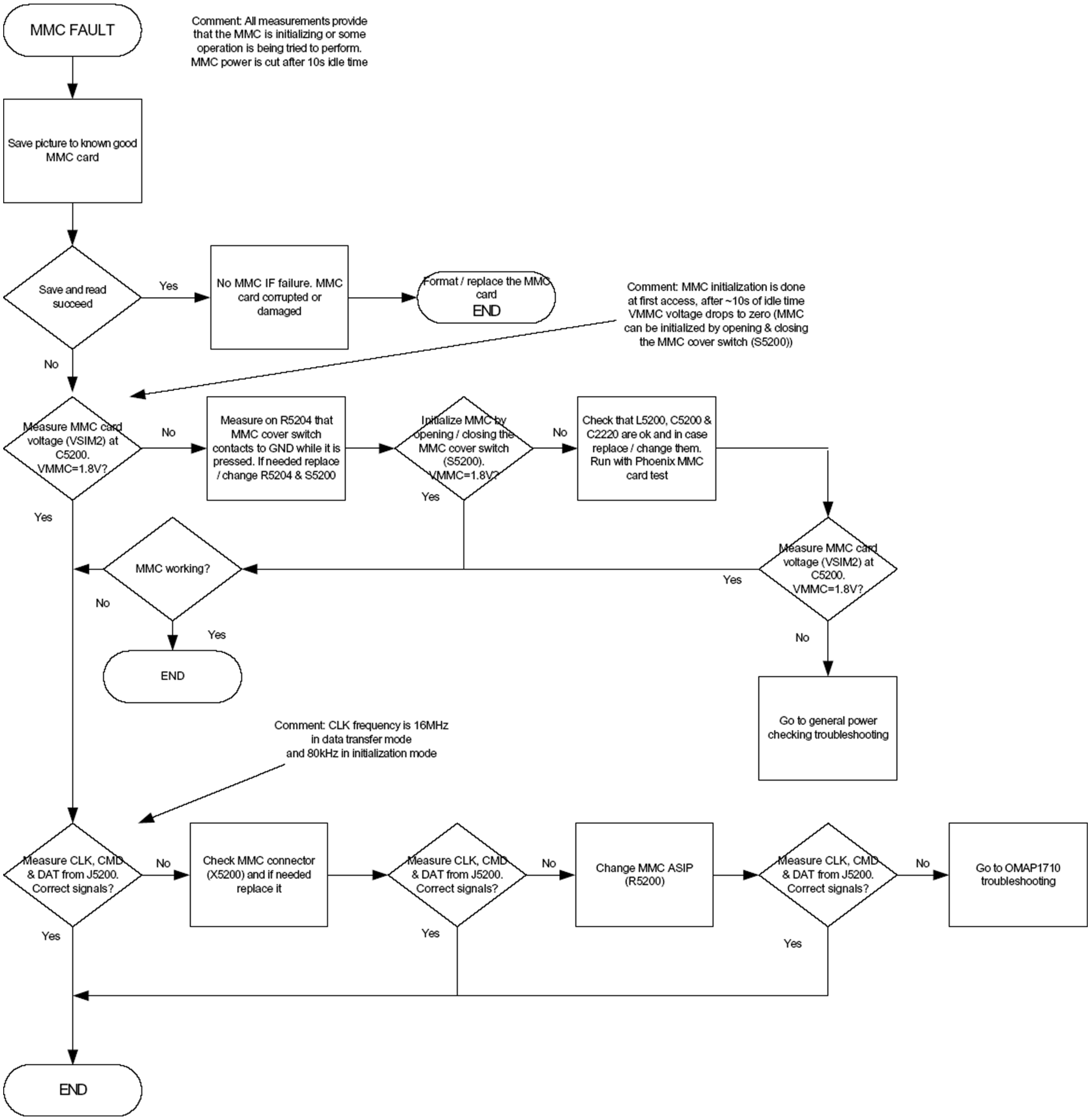
SIM card troubleshooting

Troubleshooting flow


SIM FAULT
Check SIM connector (X2700). OK?
No
Check & clean connector contacts & pads. In case replace connector
Yes
Change Retu (N2200)
Yes
Perform SIM BB selftests. OK?
No
Phoenix can communicate with phone CMT side?
No
Go to general power checking troubleshooting
Perform SIM BB self tests. OK?
No
RAP3G FAIL END
Yes
Yes
Perform Phoenix SIM tests. OK?
No
Measure VSIM1 from C2212 with oscilloscope. 1.8V & 3.0V pulses seen after SIM power up?
No
Measure VSIM1 resistance to GND. Is it low? (Nom. ~460kohm, when phone not powered)
No
Change Retu (N2200)
Yes
Yes
Is the SIM detection reliable?
No
Check and clean battery centre contact. Verify BSI signal steady voltage
Check C2212 & C2700. OK?
No
Change / replace C2212 and C2700
Yes
Yes
Change SIM ASIP (R2700) OK?
Yes
No
Problem solved
No
Check CLK (J2213), DAT (J2214) & IOC (J2215) between RAP3G & Retu. Signals present (1.8V)?
No
Change SIM ASIP (R2700) if not done yet
Change Retu (N2200) if not done yet
Yes
Yes
Yes
Check CLK (J2213), DAT (J2214) & IOC (J2215) between RAP3G & Retu. Signals present (1.8V)?
No
Problem solved?
No
Analyze SIM interface signals & look for errors in rise/fall times due to wrong fitted/faulty passives
RAP3G FAIL END
Yes
END

MMC troubleshooting

Troubleshooting flow


MMC FAULT
Comment: All measurements provide that the MMC is initializing or some operation is being tried to perform. MMC power is cut after 10s idle time
Save picture to known good MMC card
Save and read succeed
Yes
No MMC IF failure. MMC card corrupted or damaged
Format / replace the MMC card END
Comment: MMC initialization is done at first access, after ~10s of idle time VMMC voltage drops to zero (MMC can be initialized by opening & closing the MMC cover switch (S5200))
No
Measure MMC card voltage (VSIM2) at C5200. VMMC=1.8V?
No
Measure on R5204 that MMC cover switch contacts to GND while it is pressed. If needed replace / change R5204 & S5200
Initialize MMC by opening / closing the MMC cover switch (S5200). VMMC=1.8V?
No
Check that L5200, C5200 & C2220 are ok and in case replace / change them. Run with Phoenix MMC card test
Yes
Yes
MMC working?
Yes
Measure MMC card voltage (VSIM2) at C5200. VMMC=1.8V?
No
Yes
No
END
Go to general power checking troubleshooting
Comment: CLK frequency is 16MHz in data transfer mode and 80kHz in initialization mode
Measure CLK, CMD & DAT from J5200. Correct signals?
No
Check MMC connector (X5200) and if needed replace it
Measure CLK, CMD & DAT from J5200. Correct signals?
No
Change MMC ASIP (R5200)
Measure CLK, CMD & DAT from J5200. Correct signals?
No
Go to OMAP1710 troubleshooting
Yes
Yes
Yes
END

Keyboard troubleshooting

Context

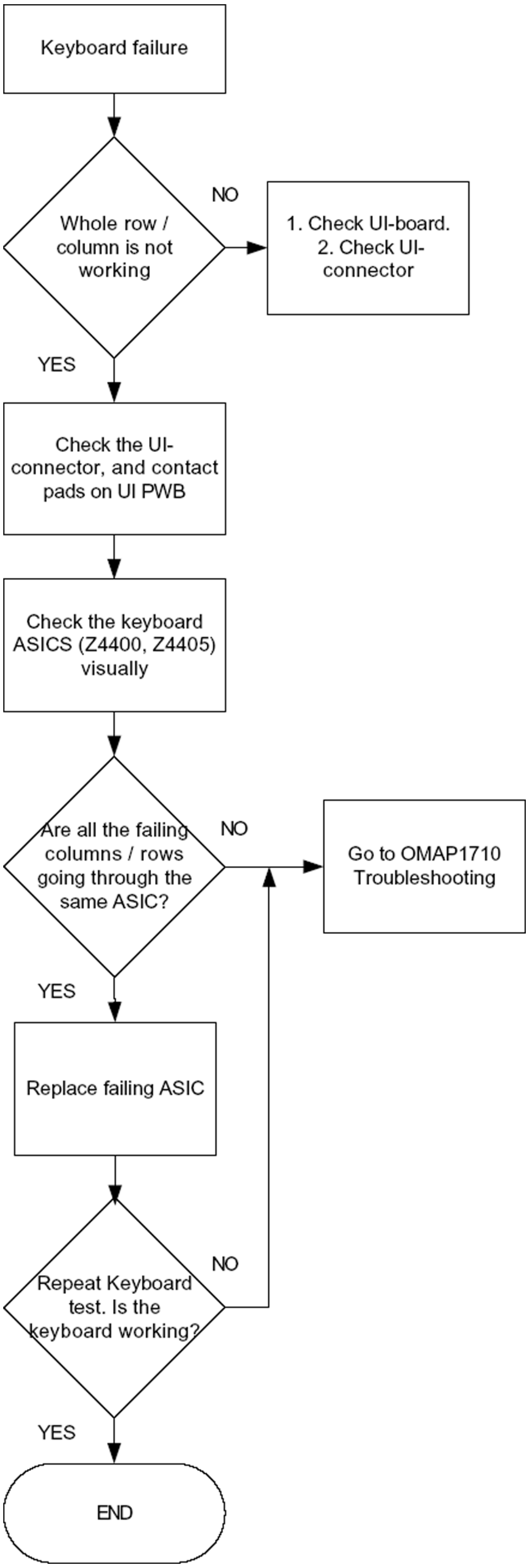
There are two possible failure modes in the keyboard module:

- One or more keys can be stuck, so that the key does not react when a keydome is pressed. This kind of failure is caused by mechanical reasons (dirt, rust).

- Malfunction of several keys at the same time; this happens when one or more rows or columns are failing (shortcut or open connection). For a more detailed description of the keyboard and keymatrix, see section Keyboard (page 9–23).

If the failure mode is not clear, start with the Keyboard Test in Phoenix.

Troubleshooting flow

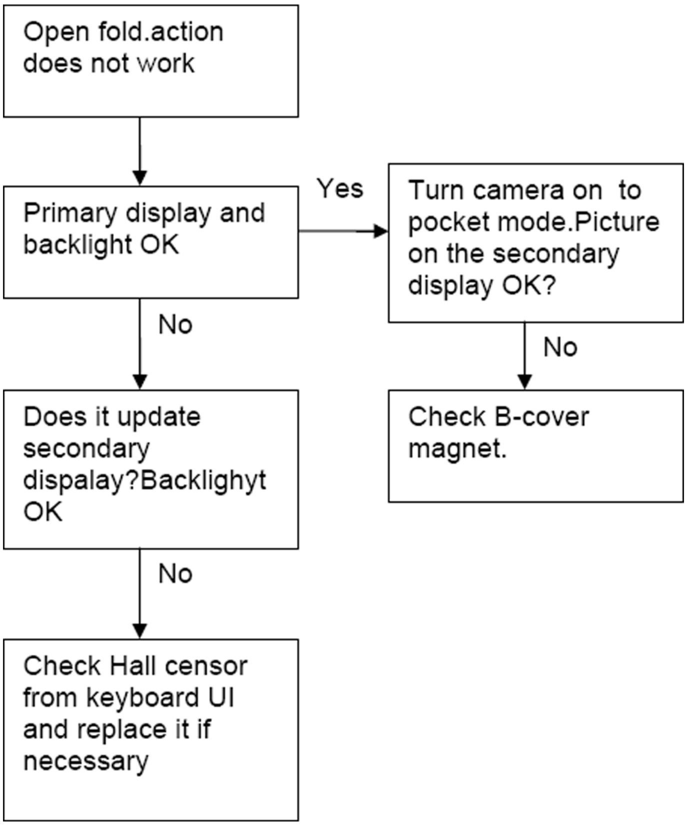

Keyboard failure
Whole row / column is not working
NO
1. Check UI-board.
2. Check UI-connector
YES
Check the UI-connector, and contact pads on UI PWB
Check the keyboard ASICS (Z4400, Z4405) visually
Are all the failing columns / rows going through the same ASIC?
NO
Go to OMAP1710 Troubleshooting
YES
Replace failing ASIC
Repeat Keyboard test. Is the keyboard working?
NO
YES
END

Hall sensor troubleshooting

Symptoms and diagnosis

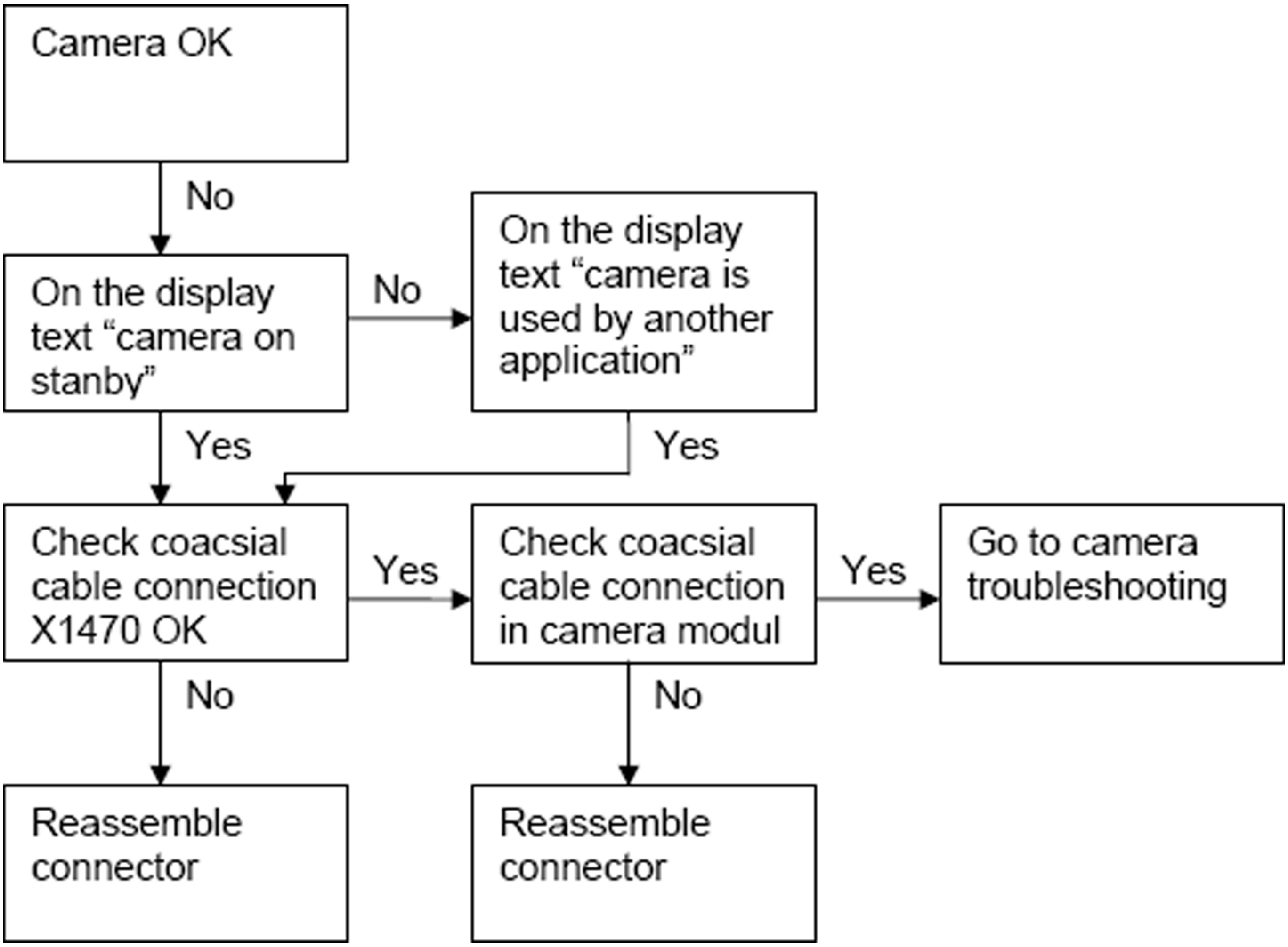
The open fold does not work properly.

Troubleshooting flow


Open fold.action does not work
Primary display and backlight OK
Yes
Turn camera on to pocket mode.Picture on the secondary display OK?
No
Check B-cover magnet.
No
Does it update secondary dispalay?Backlighyt OK
No
Check Hall censor from keyboard UI and replace it if necessary

Camera connector troubleshooting

Troubleshooting flow


Camera OK
No
On the display text "camera on stanby"
No
On the display text "camera is used by another application"
Yes
Yes
Check coacsial cable connection X1470 OK
Yes
Check coacsial cable connection in camera modul
Yes
Go to camera troubleshooting
No
No
Reassemble connector
Reassemble connector

Display module troubleshooting

General instructions for display troubleshooting

The first step is to verify with a working display that the fault is not on the display module itself. The display module cannot be repaired.

The second step is to check that the cellular engine is working normally. This can be done by connecting the phone to a docking station and starting Phoenix service software. With the help of Phoenix read the phone information to check that also application engine is functioning normally (you should be able to read the APE ID).

After these checks proceed to the display troubleshooting flowcharts. Use the Display Test tool in Phoenix to find the detailed fault mode.

Operating modes of the display

Display is in a normal mode when the phone is in active use.

Display is in a partial idle mode when the phone is in the screen saver mode.

The operating modes of the display can be controlled with the help of Phoenix.

Table 9 Display module troubleshooting cases

Display blank	There is no image on the display. Display looks the same when the phone is on as it does when the phone is off. The backlight can be on in some cases.
Image on the display not correct	Image on the display can be corrupted or part of the image can be missing. If part of image is missing change the display module. If the image is otherwise corrupted, follow the appropriate troubleshooting diagram.
Backlight dim or not working at all	Backlight LED components are inside the display module. Backlight failure can also be in the connector or in the backlight power source in the main engine of the phone. Backlight is also controlled automatically by the ambient light sensor. This means that in case the display is working (image OK) but the backlight is not, follow the Display and keyboard backlight troubleshooting (page 6–35).
Visual defects (pixel)	Pixel defects can be checked by controlling the display with Phoenix. Use both colours, black and white, on a full screen. The display may have some random pixel defects that are acceptable for this type of display. The criteria when pixel defects are regarded as a display failure, resulting in a replacement of the display, are presented the table below.

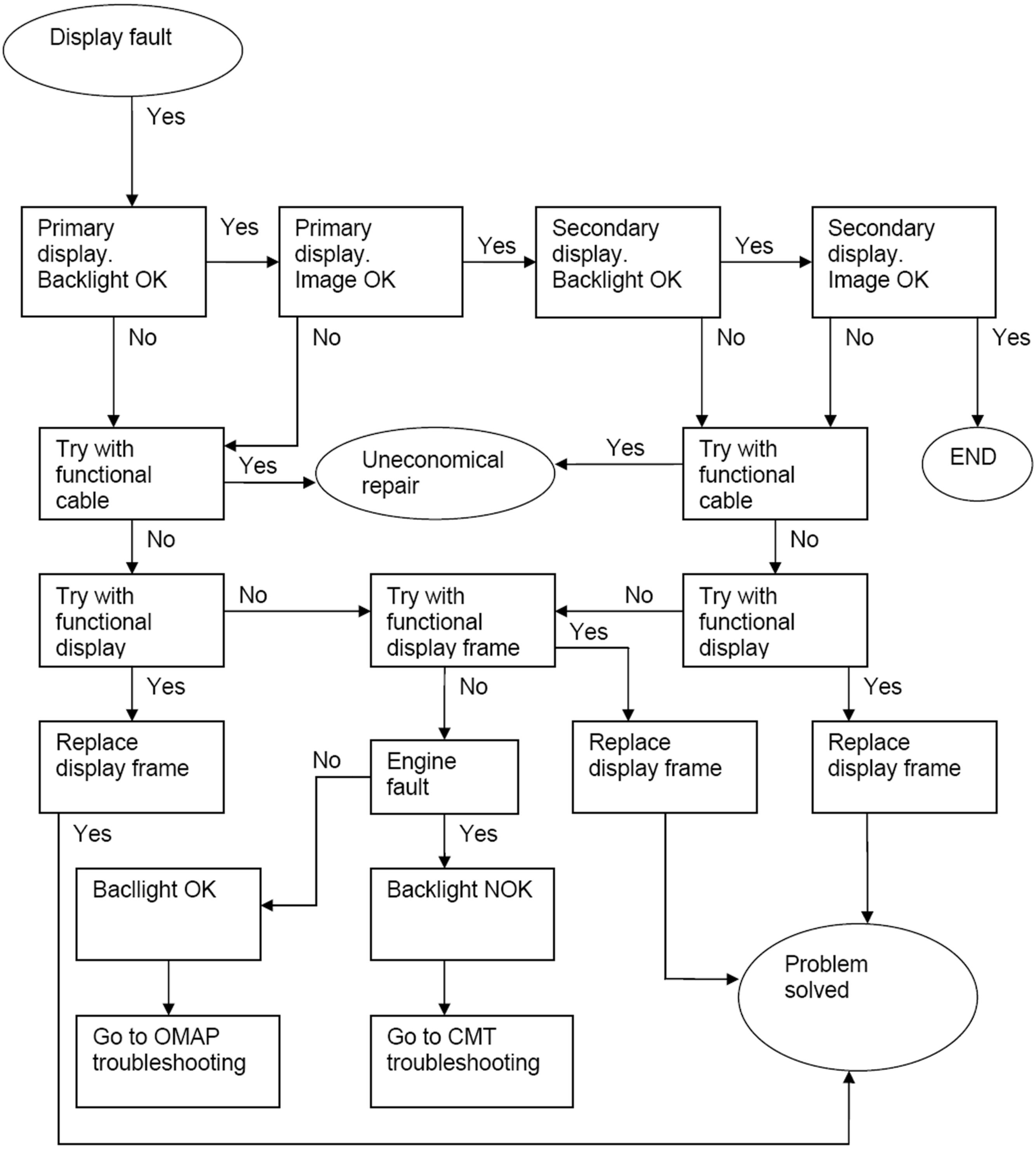
Table 10 Pixel defects

Item	White dot defect					Black dot defect	Total
1	Defect counts	R	G	B	White Dot Total	1	1
		1	1	1	1		
2	Combined defect counts	Not allowed. Two single dot defects that are within 5 mm of each other should be interpreted as combined dot defect.					

Note: Blinking pixels are not allowed in normal operating temperatures and light conditions.

Display fault troubleshooting

Troubleshooting flow

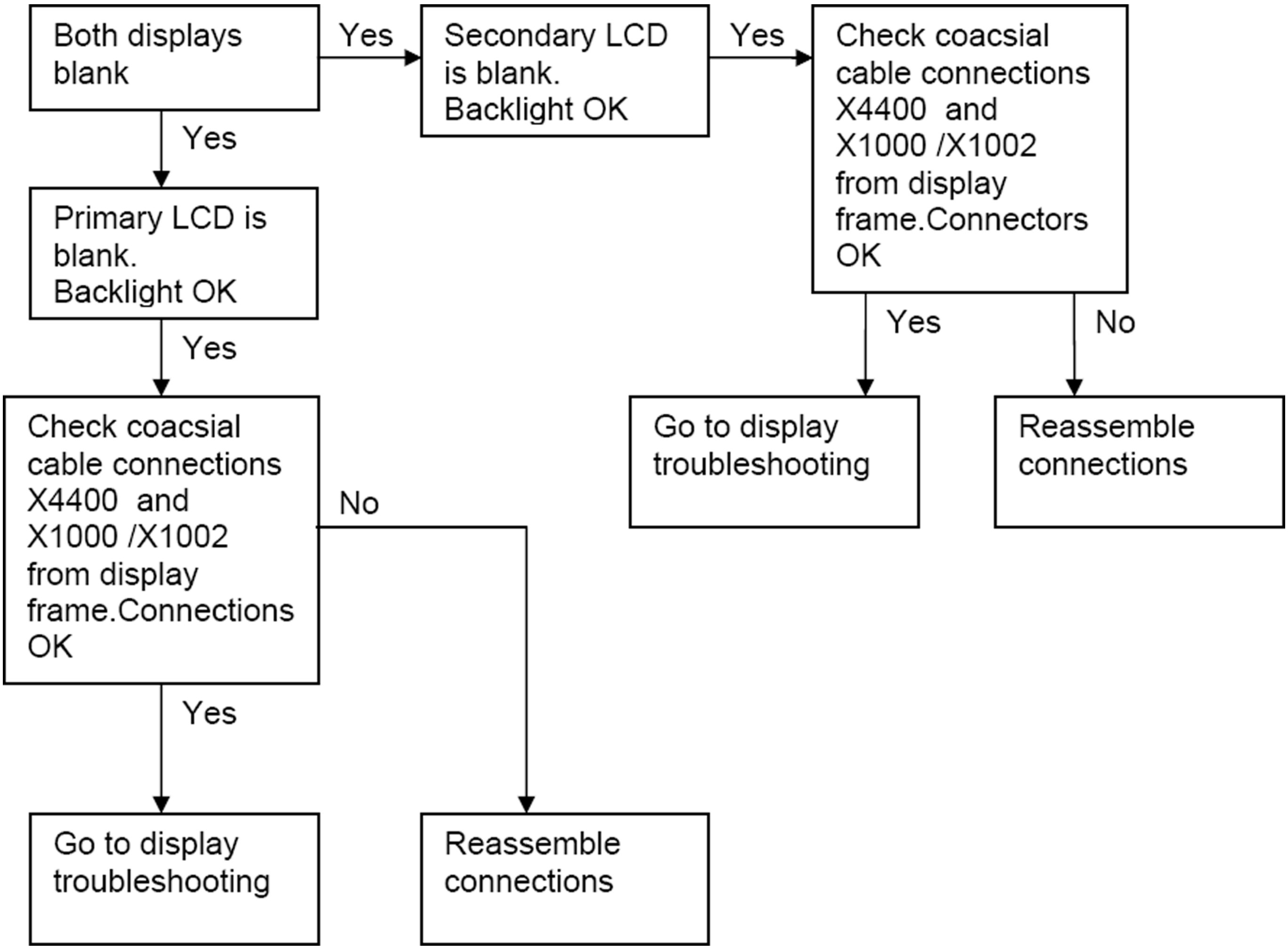

Display fault
Yes
Primary display. Backlight OK
Yes
Primary display. Image OK
Yes
Secondary display. Backlight OK
Yes
Secondary display. Image OK
No
No
No
No
Yes
Try with functional cable
Yes
Uneconomical repair
Yes
Try with functional cable
END
No
No
Try with functional display
No
Try with functional display frame
No
Yes
Try with functional display
Yes
No
Yes
Replace display frame
No
Engine fault
Replace display frame
Replace display frame
Yes
Yes
Bacllight OK
Backlight NOK
Problem solved
Go to OMAP troubleshooting
Go to CMT troubleshooting

Blank display troubleshooting

Symptoms and diagnosis

The display does not show any information at all.

Troubleshooting flow


Both displays blank
Yes
Secondary LCD is blank. Backlight OK
Yes
Check coacsial cable connections X4400 and X1000 /X1002 from display frame.Connectors OK
Yes
Primary LCD is blank. Backlight OK
Yes
Yes
No
Go to display troubleshooting
Reassemble connections
Check coacsial cable connections X4400 and X1000 /X1002 from display frame.Connections OK
No
Yes
Go to display troubleshooting
Reassemble connections

Display and keyboard backlight troubleshooting

Context

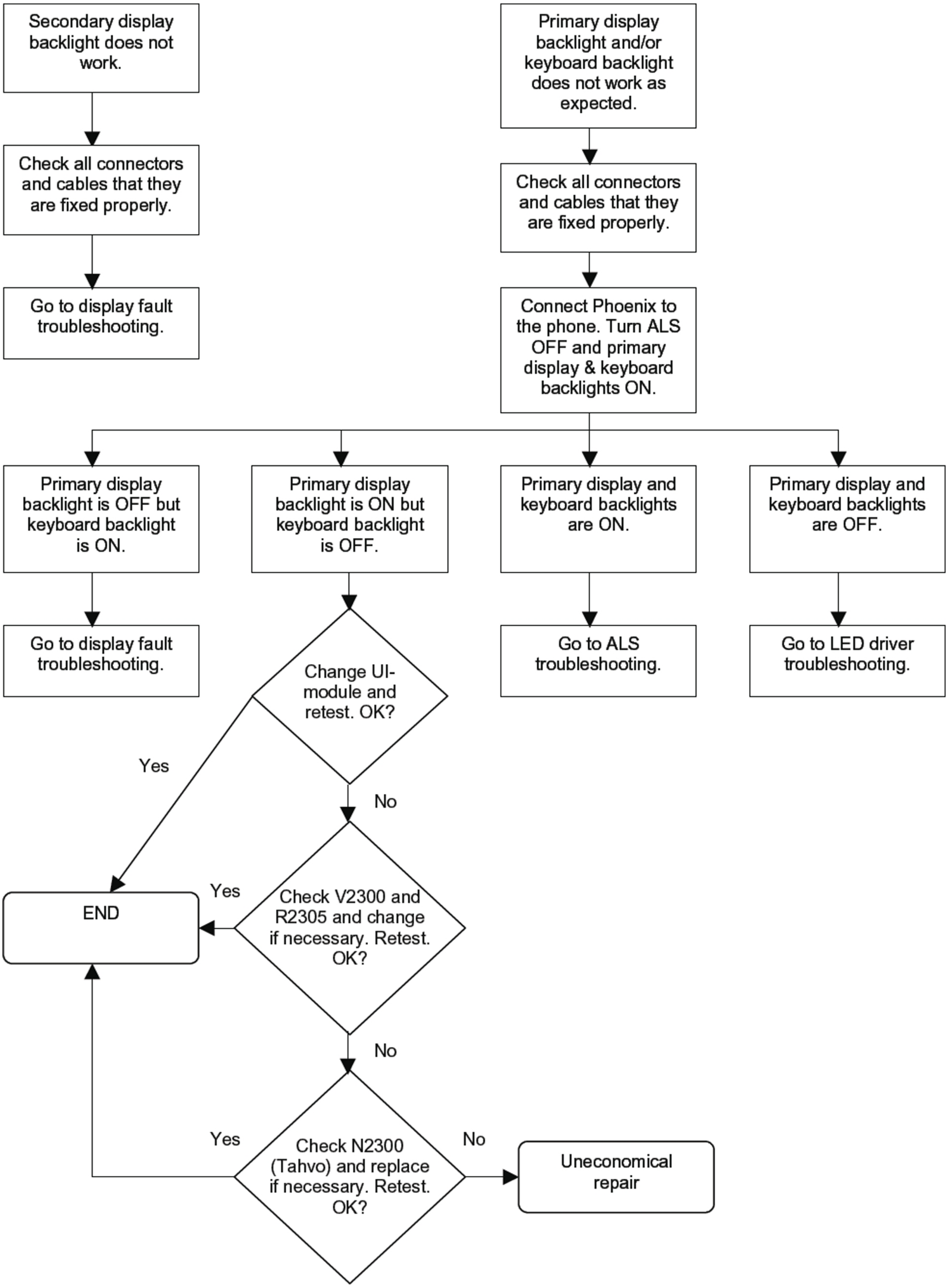
The device has one LED driver that provides current for both display and keyboard backlights.

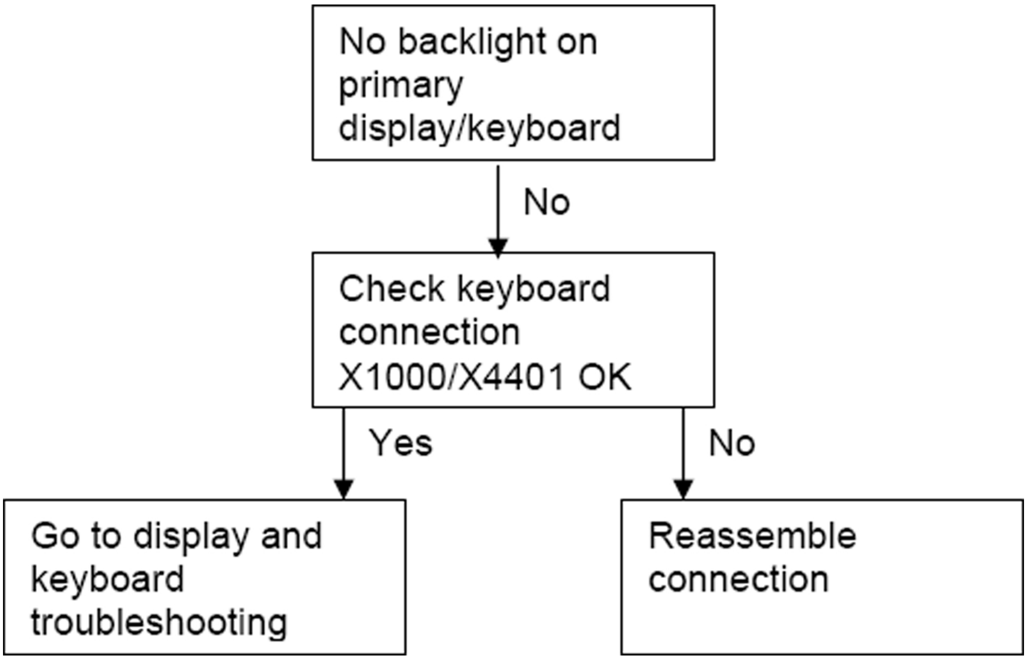
Keyboard backlights are turned ON only in dark conditions. This is controlled by the Ambient Light Sensor (ALS). Also the brightness of the display is adjusted by the ambient light sensor.

You can enable/disable ALS with the help of Phoenix service software.

Display brightness can be adjusted manually, if ALS is disabled. If the ambient light sensor is enabled, it adjusts the display brightness automatically.

Troubleshooting flow


Secondary display backlight does not work.
Check all connectors and cables that they are fixed properly.
Go to display fault troubleshooting.
Primary display backlight and/or keyboard backlight does not work as expected.
Check all connectors and cables that they are fixed properly.
Connect Phoenix to the phone. Turn ALS OFF and primary display & keyboard backlights ON.
Primary display backlight is OFF but keyboard backlight is ON.
Primary display backlight is ON but keyboard backlight is OFF.
Primary display and keyboard backlights are ON.
Primary display and keyboard backlights are OFF.
Go to display fault troubleshooting.
Change UI-module and retest. OK?
Go to ALS troubleshooting.
Go to LED driver troubleshooting.
Yes
No
END
Yes
Check V2300 and R2305 and change if necessary. Retest. OK?
No
Yes
Check N2300 (Tahvo) and replace if necessary. Retest. OK?
No
Uneconomical repair


No backlight on primary display/keyboard
No
Check keyboard connection X1000/X4401 OK
Yes
No
Go to display and keyboard troubleshooting
Reassemble connection

ALS troubleshooting

Context

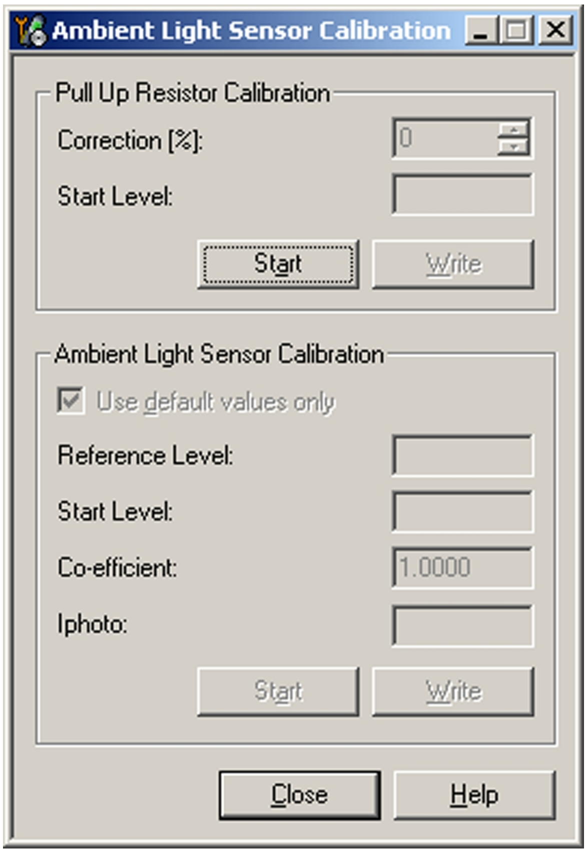
If a phototransistor is broken, the display frame assy has to be replaced. The display frame assy has to be also replaced if the calibration values are lost by some other reason (e.g. after replacing the NOR memory chip D3000).

If the phototransistor is changed, the calibration value in the phone memory has to be changed to the default value ‘1’.

Make sure that you have completed Display and keypad backlight troubleshooting (page 6–35) first before starting ALS troubleshooting.

Here are some hints for ALS troubleshooting; the following troubleshooting diagram refers to these:

- Phoenix LED control tool also shows you luminance. The correct luminance in darkness is <20lx, and in office environment 100-2000lx. The luminance value depends strongly on the light source and the angle of the phone, so these values are only a rough guideline.
- LED driver control voltage measurement points can be found from LED driver troubleshooting (page 6–40) section. When backlight brightness is set to 100%, both GENOUT-signals are low, and enable PWM is 100%.
- Phoenix has an ambient light sensor calibration tool for changing calibration values. The pull-up resistor calibration is done first:
  a Cover the light guide (upper part of the A Cover).
  b Click 'Start' and 'Write'.
  c Manually change the ambient light sensor value to the default value. There is no special tool for this, but you have to perform calibration normally and then set the "Co-efficient" result to '1' before writing it to the phone memory.


Ambient Light Sensor Calibration
Pull Up Resistor Calibration
Start Level:
Start
Write
Ambient Light Sensor Calibration
Reference Level:
Start Level:
Iphoto:
Start
Write
Close
Help

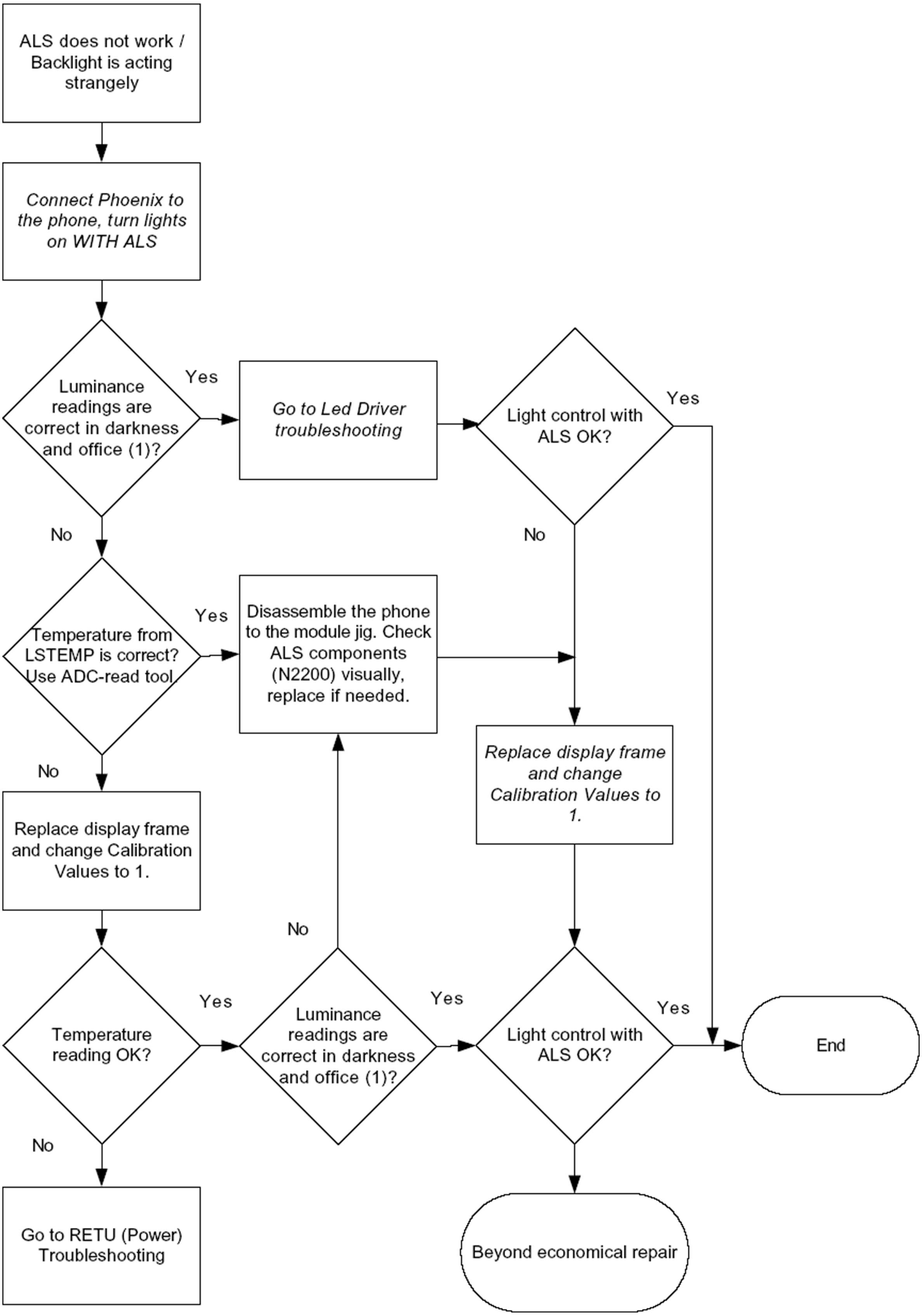
Correction [%]: 0

☑ Use default values only

Co-efficient: 1.0000

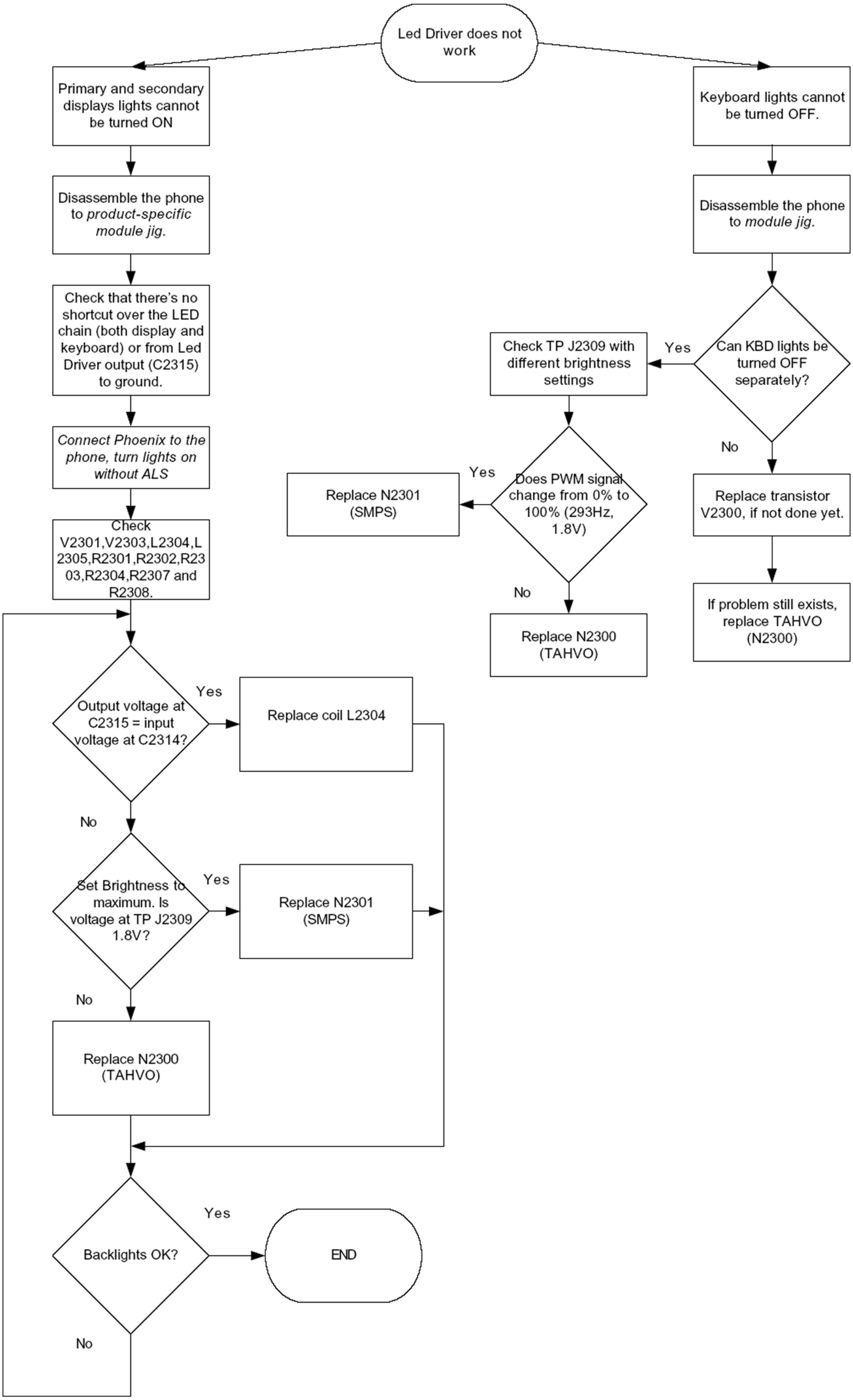
Figure 45 Ambient Light Sensor Calibration window

Troubleshooting flow


ALS does not work / Backlight is acting strangely
Connect Phoenix to the phone, turn lights on WITH ALS
Luminance readings are correct in darkness and office (1)?
Yes
Go to Led Driver troubleshooting
Light control with ALS OK?
Yes
No
No
Temperature from LSTEMP is correct? Use ADC-read tool
Yes
Disassemble the phone to the module jig. Check ALS components (N2200) visually, replace if needed.
Replace display frame and change Calibration Values to 1.
No
Replace display frame and change Calibration Values to 1.
No
Temperature reading OK?
Yes
Luminance readings are correct in darkness and office (1)?
Yes
Light control with ALS OK?
Yes
End
No
Go to RETU (Power) Troubleshooting
Beyond economical repair

LED driver troubleshooting

Troubleshooting flow


Led Driver does not work
Primary and secondary displays lights cannot be turned ON
Keyboard lights cannot be turned OFF.
Disassemble the phone to *product-specific module jig.*
Disassemble the phone to *module jig.*
Check that there's no shortcut over the LED chain (both display and keyboard) or from Led Driver output (C2315) to ground.
Check TP J2309 with different brightness settings
Yes
Can KBD lights be turned OFF separately?
No
Connect Phoenix to the phone, turn lights on without ALS
Replace N2301 (SMPS)
Yes
Does PWM signal change from 0% to 100% (293Hz, 1.8V)
Replace transistor V2300, if not done yet.
Check V2301,V2303,L2304,L2305,R2301,R2302,R2303,R2304,R2307 and R2308.
No
If problem still exists, replace TAHVO (N2300)
Replace N2300 (TAHVO)
Yes
Output voltage at C2315 = input voltage at C2314?
Replace coil L2304
No
Yes
Set Brightness to maximum. Is voltage at TP J2309 1.8V?
Replace N2301 (SMPS)
No
Replace N2300 (TAHVO)
Yes
Backlights OK?
END
No

Bluetooth troubleshooting

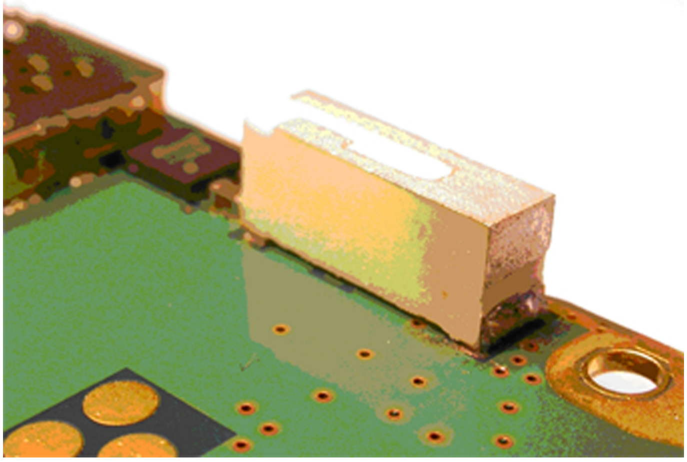
Introduction to Bluetooth troubleshooting

There are two main Bluetooth problems that can occur:

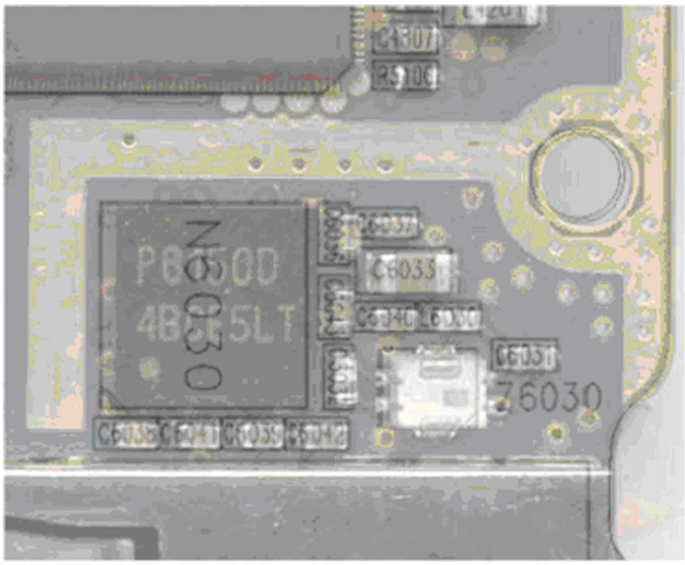
Problem	Description
Detachment of the BT antenna.	This would most likely happen if the device has been dropped repeatedly to the ground. It could cause the BT antenna to become loose or partially detached from the PWB. (see next page for details about BT antenna HW and Mechanics)
A malfunction in the BT ASIC, BB ASICs or Phone's BT SMD components.	This is unpredictable and could have many causes i.e. SW or HW related.

The main issue is to find out if the problem is related to the BT antenna or related to the BT system or the phone's BB and then replace/fix the faulty component.

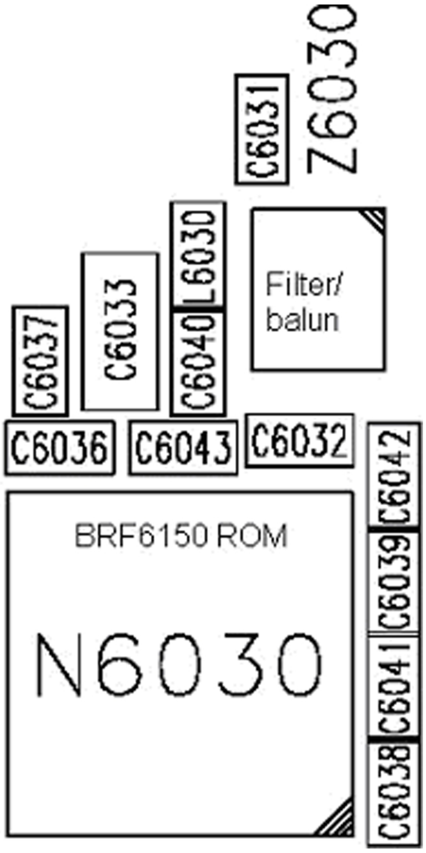
Location of the BT antenna



Bluetooth layout


C4307
R5100
P6550D
4B05LT
N6030
C6037
C6033
C6040
L6030
C6031
Z6030
C6038
C6041
C6039
C6042

Bluetooth component layout


Z6030
C6031
L6030
Filter/
balun
C6037
C6033
C6040
C6036
C6043
C6032
C6042
C6039
C6041
C6038
BRF6150 ROM
N6030

Bluetooth settings for Phoenix

Steps

1. Start *Phoenix* service software.

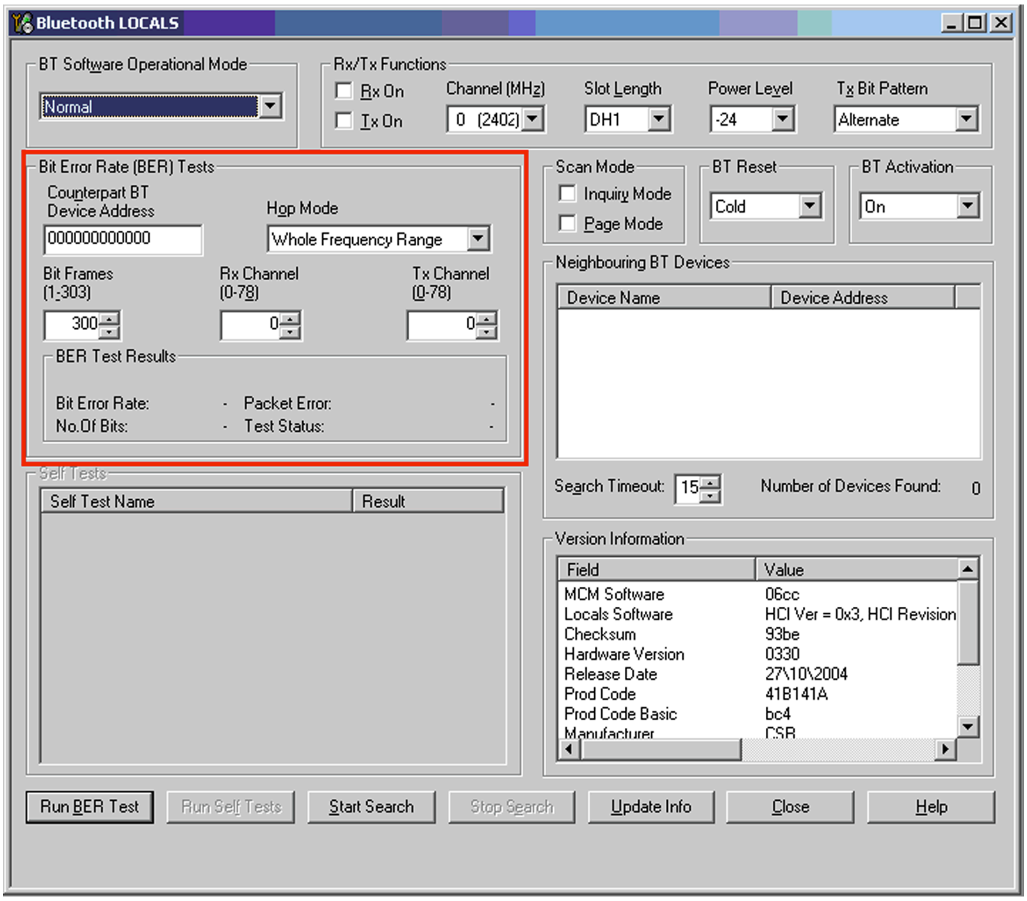
2. From the **File** menu, choose **Open Product**, and then choose the correct type designator from the **Product** list.
3. Place the phone to a flash adapter in the local mode.
4. Choose **Testing→Bluetooth LOCALS** .
5. Locate JBT-9's serial number (12 digits) found in the type label on the back of JBT-9.

   In addition to JBT-9, also JBT-3 and JBT-6 Bluetooth test boxes can be used.
6. In the *Bluetooth LOCALS* window, write the 12-digit serial number on the **Counterpart BT Device Address** line.

   This needs to be done only once provided that JBT-9 is not changed.
7. Place the JBT-9 box near (within 10 cm) the BT antenna and click **Run BER Test**.

Results

Bit Error Rate test result is displayed in the *Bit Error Rate (BER) Tests* pane in the *Bluetooth LOCALS* window.


Bluetooth LOCALS
BT Software Operational Mode
Rx/Tx Functions
Bit Error Rate (BER) Tests
BER Test Results
Scan Mode
BT Reset
BT Activation
Neighbouring BT Devices
Device Name
Device Address
Self Tests
Self Test Name
Result
Version Information
Run BER Test
Run Self Tests
Start Search
Stop Search
Update Info
Close
Help

BT Software Operational Mode: Normal
☐ Rx On
☐ Tx On
Channel (MHz): 0 (2402)
Slot Length: DH1
Power Level: -24
Tx Bit Pattern: Alternate
Counterpart BT Device Address: 000000000000
Hop Mode: Whole Frequency Range
Bit Frames (1-303): 300
Rx Channel (0-78): 0
Tx Channel (0-78): 0
Bit Error Rate: -
Packet Error: -
No.Of Bits: -
Test Status: -
☐ Inquiry Mode
☐ Page Mode
BT Reset: Cold
BT Activation: On
Search Timeout: 15
Number of Devices Found: 0

Field	Value
MCM Software	06cc
Locals Software	HCI Ver = 0x3, HCI Revision
Checksum	93be
Hardware Version	0330
Release Date	27\10\2004
Prod Code	41B141A
Prod Code Basic	bc4
Manufacturer	CSR

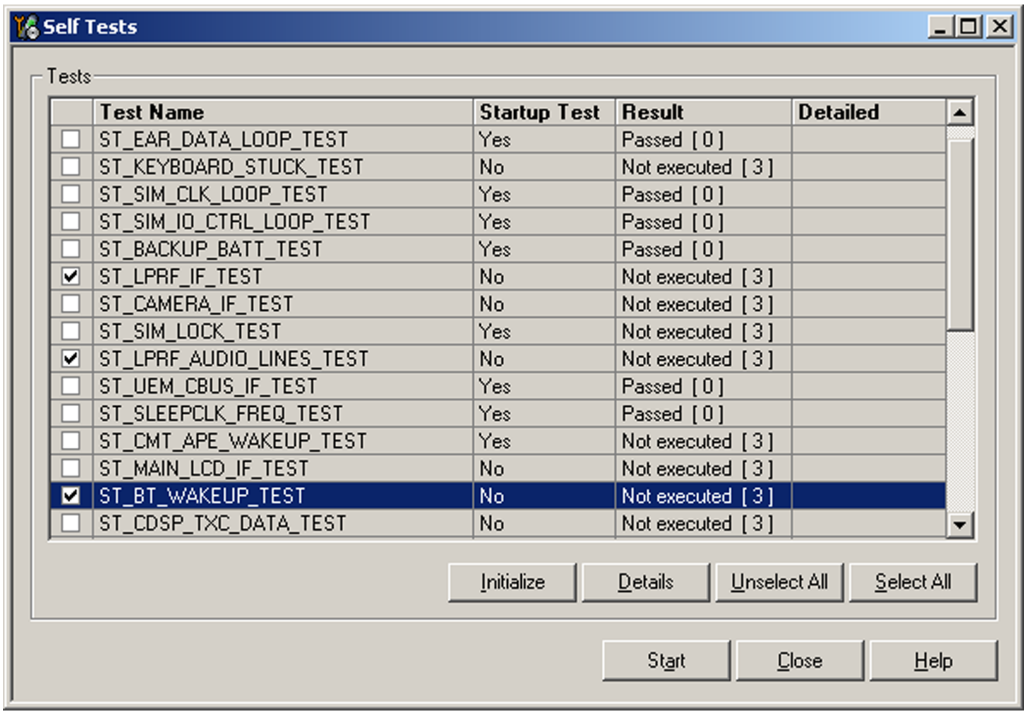
Figure 46 BER test result

Bluetooth self tests in Phoenix

Steps

1. Start *Phoenix* service software.
2. Choose**File→Scan Product.**
3. Place the phone to a flash adapter.
4. From the **Mode** drop-down menu, set mode to **Local**.

5. Choose **Testing→Self Tests.**
6. In the *Self Tests* window check the following Bluetooth related tests:
   - **ST_LPRF_IF_TEST**
   - **ST_LPRF_AUDIO_LINES_TEST**
   - **ST_BT_WAKEUP_TEST**
7. To run the tests, click **Start**.

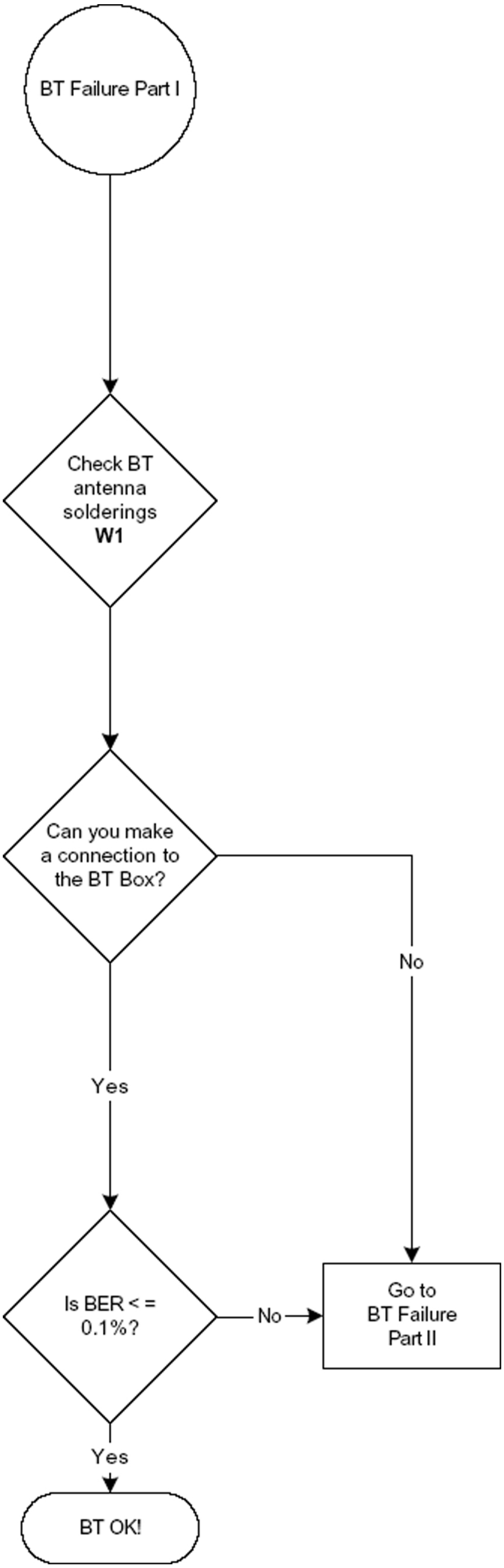


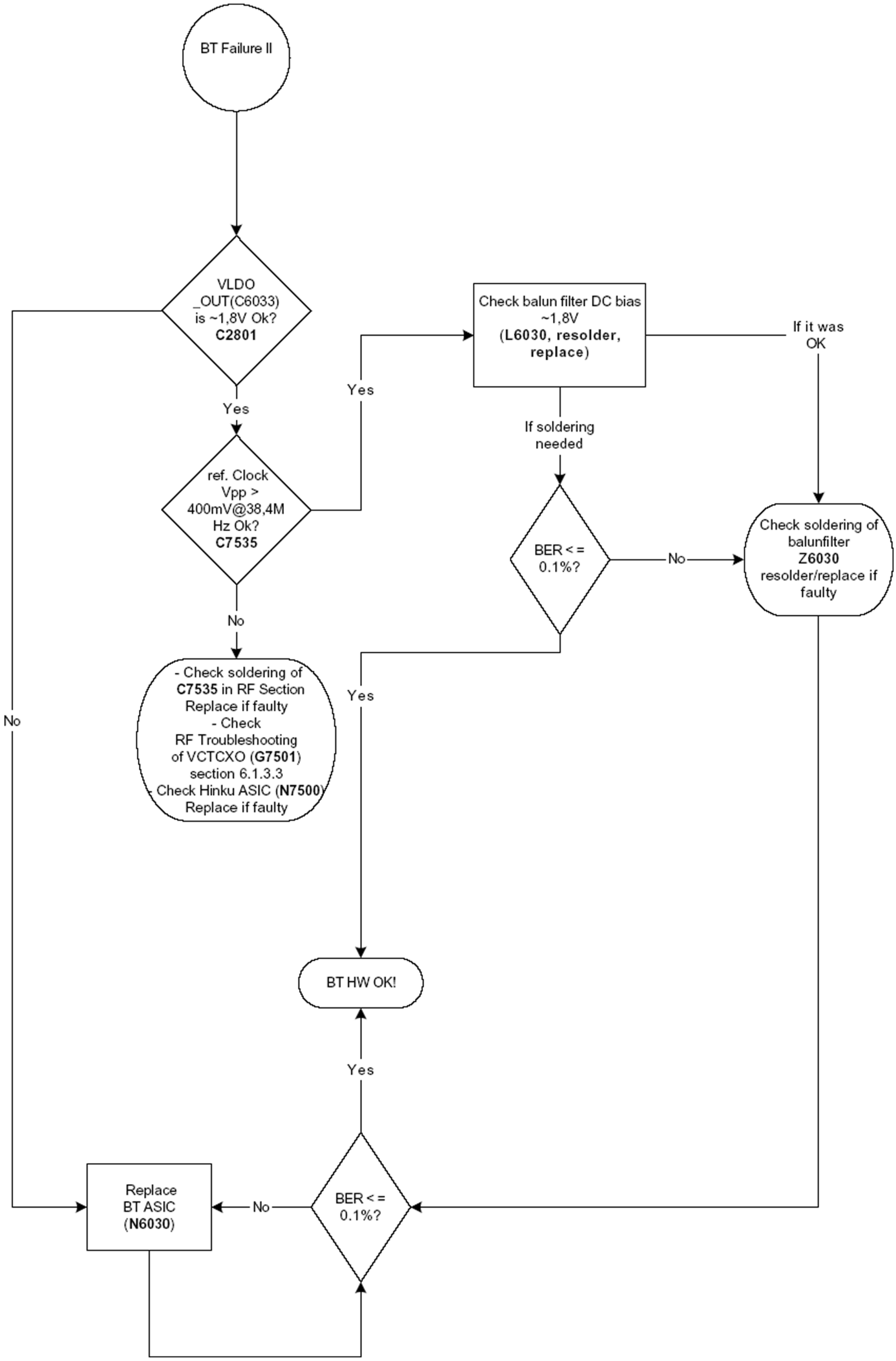
	Test Name	Startup Test	Result	Detailed
☐	ST_EAR_DATA_LOOP_TEST	Yes	Passed [0]	
☐	ST_KEYBOARD_STUCK_TEST	No	Not executed [3]	
☐	ST_SIM_CLK_LOOP_TEST	Yes	Passed [0]	
☐	ST_SIM_IO_CTRL_LOOP_TEST	Yes	Passed [0]	
☐	ST_BACKUP_BATT_TEST	Yes	Passed [0]	
☑	ST_LPRF_IF_TEST	No	Not executed [3]	
☐	ST_CAMERA_IF_TEST	No	Not executed [3]	
☐	ST_SIM_LOCK_TEST	Yes	Not executed [3]	
☑	ST_LPRF_AUDIO_LINES_TEST	No	Not executed [3]	
☐	ST_UEM_CBUS_IF_TEST	Yes	Passed [0]	
☐	ST_SLEEPCLK_FREQ_TEST	Yes	Passed [0]	
☐	ST_CMT_APE_WAKEUP_TEST	Yes	Not executed [3]	
☐	ST_MAIN_LCD_IF_TEST	No	Not executed [3]	
☑	ST_BT_WAKEUP_TEST	No	Not executed [3]	
☐	ST_CDSP_TXC_DATA_TEST	No	Not executed [3]	

Figure 47 Bluetooth self tests in *Phoenix*

Bluetooth BER failure troubleshooting

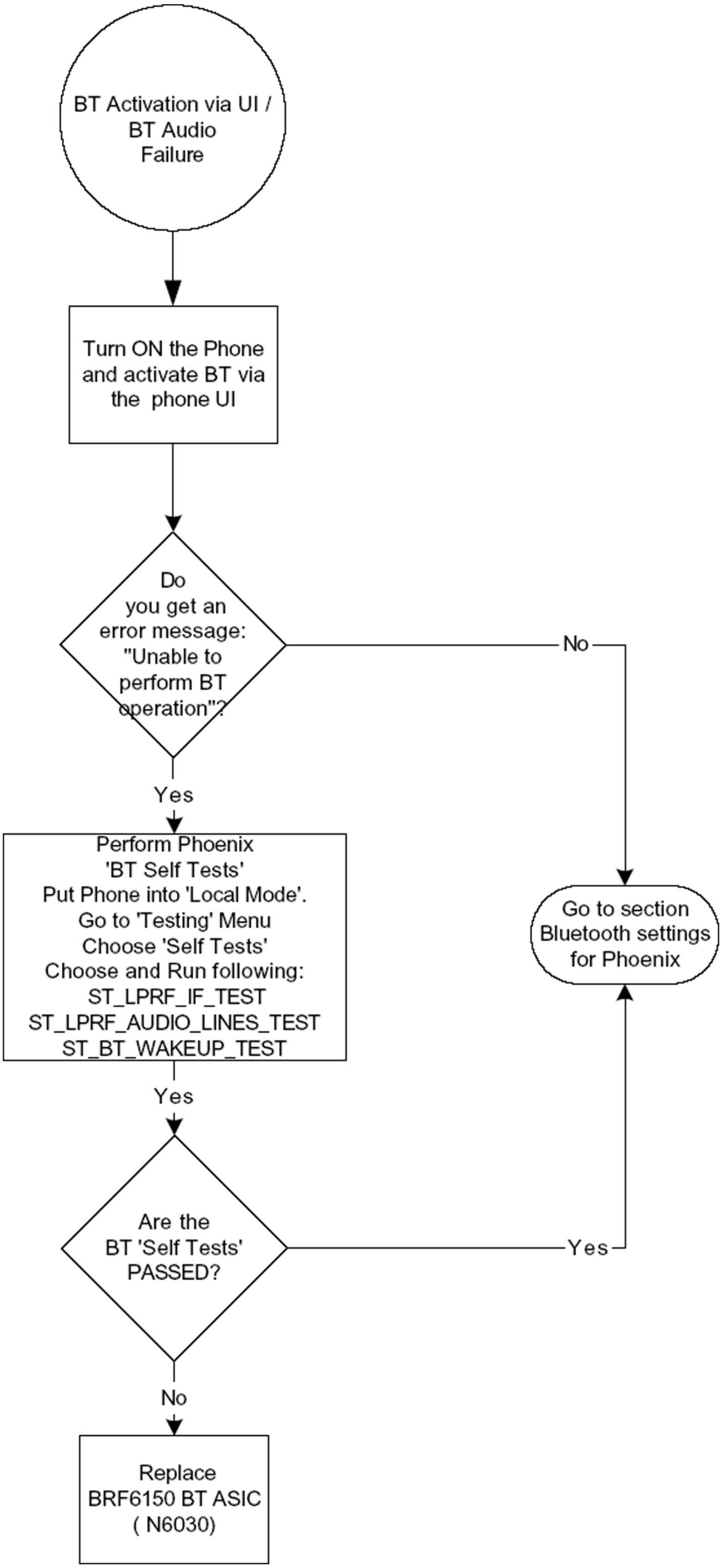
Troubleshooting flow


BT Failure Part I
Check BT antenna solderings W1
Can you make a connection to the BT Box?
No
Yes
Is BER < = 0.1%?
No
Go to BT Failure Part II
Yes
BT OK!


BT Failure II
VLDO _OUT(C6033) is ~1,8V Ok? C2801
Yes
No
ref. Clock Vpp > 400mV@38,4M Hz Ok? C7535
Yes
No
- Check soldering of C7535 in RF Section Replace if faulty
- Check RF Troubleshooting of VCTCXO (G7501) section 6.1.3.3
- Check Hinku ASIC (N7500) Replace if faulty
Check balun filter DC bias ~1,8V (L6030, resolder, replace)
If it was OK
If soldering needed
BER <= 0.1%?
No
Yes
Check soldering of balunfilter Z6030 resolder/replace if faulty
BT HW OK!
Yes
BER <= 0.1%?
No
Replace BT ASIC (N6030)

BT audio failure troubleshooting

Troubleshooting flow


BT Activation via UI / BT Audio Failure
Turn ON the Phone and activate BT via the phone UI
Do you get an error message: "Unable to perform BT operation"?
No
Yes
Perform Phoenix 'BT Self Tests' Put Phone into 'Local Mode'. Go to 'Testing' Menu Choose 'Self Tests' Choose and Run following: ST_LPRF_IF_TEST ST_LPRF_AUDIO_LINES_TEST ST_BT_WAKEUP_TEST
Go to section Bluetooth settings for Phoenix
Yes
Are the BT 'Self Tests' PASSED?
Yes
No
Replace BRF6150 BT ASIC (N6030)

Audio troubleshooting

Audio troubleshooting test instructions

Differential external earpiece and internal earpiece outputs can be measured either with a single-ended or a differential probe.

When measuring with a single-ended probe each output is measured against the ground.

Internal handsfree output is measured using a current probe, if a special low-pass filter designed for measuring a digital amplifier is not available. Note also that when using a current probe, the input signal frequency must be set to 2kHz.

The input signal for each loop test can be either single-ended or differential.

Required equipment

The following equipment is needed for the tests:

- Oscilloscope
- Function generator (sine waveform)
- 'Active speaker' or 'speaker and power amplifier'
- Sound level meter
- Current probe (Internal handsfree DPMA output measurement)
- Phoenix service software
- Battery voltage 3.7V

Test procedure

Audio can be tested using the Phoenix audio routings option. Three different audio loop paths can be activated:

- External microphone to Internal earpiece
- External microphone to Internal handsfree speaker
- Internal microphone to External earpiece

Each audio loop sets routing from the specified input to the specified output enabling a quick in-out test. Loop path gains are fixed and they cannot be changed using Phoenix. Correct pins and signals for each test are presented in the following table.

Phoenix audio loop tests and test results

The results presented in the table apply when no accessory is connected and battery voltage is set to 3.7V.

Earpiece, internal microphone and speaker are in place during measurement. Applying a headset accessory during measurement causes a significant drop in measured quantities.

The gain values presented in the table apply for a differential output vs. single-ended/differential input.

Loop test	Input terminal	Output terminal	Path gain [dB] (fixed)	Input voltage [mVp-p]	Differential output voltage [mVp-p]	Output DC level [V]	Output current [mA]
External Mic to External Earpiece	XMICP and GND	HSEAR R P, HSEAR R N and GND	-2.9	1000	720	1.2	NA
		HSEAR P, HSEAR N and GND					
	XMICN and GND	HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					
External Mic to Internal Earpiece	XMICP and GND	EarP and GND	-4.5	1000	600	1.2	NA
		EarN and GND					
	XMICN and GND	EarP and GND					
		EarN and GND					
External Mic to Internal handsfree	XMICP and GND	B2102 pads	-5	1000	560	0	25mA (calc.)
	XMICN and GND	B2102 pads					
Internal Mic to External Earpiece	B2100 (OUT/ GND)	HSEAR R P, HSEAR R N and GND	22.7	100	1360	1.2	NA
		HSEAR P, HSEAR N and GND					
		HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					

Measurement data

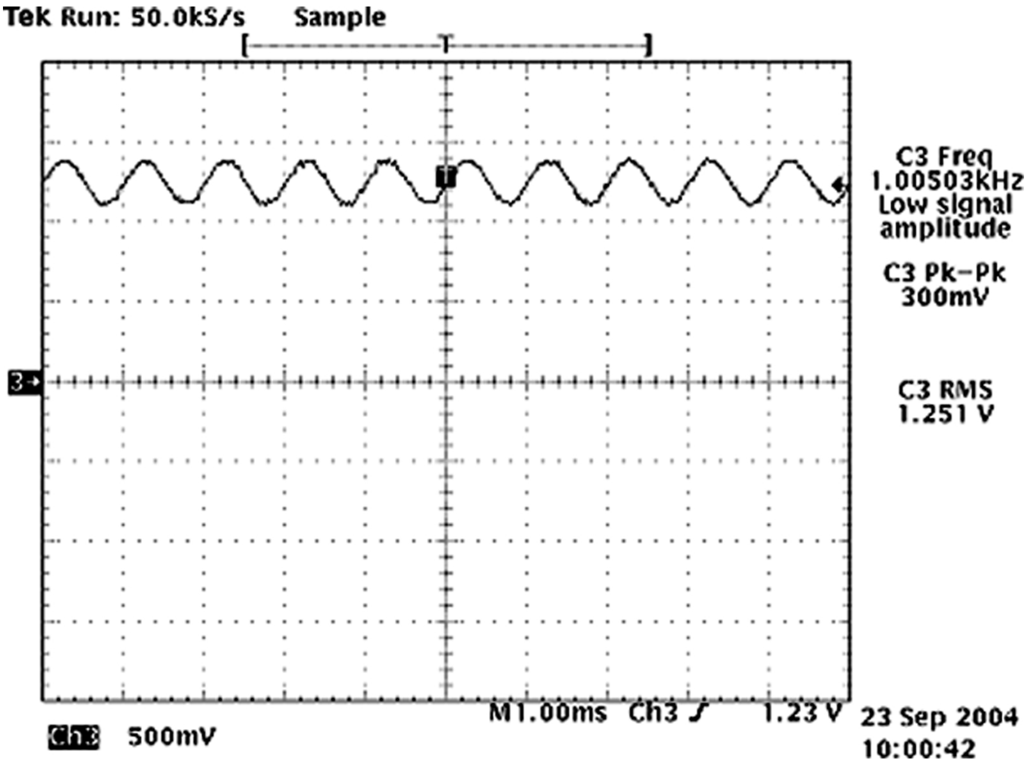
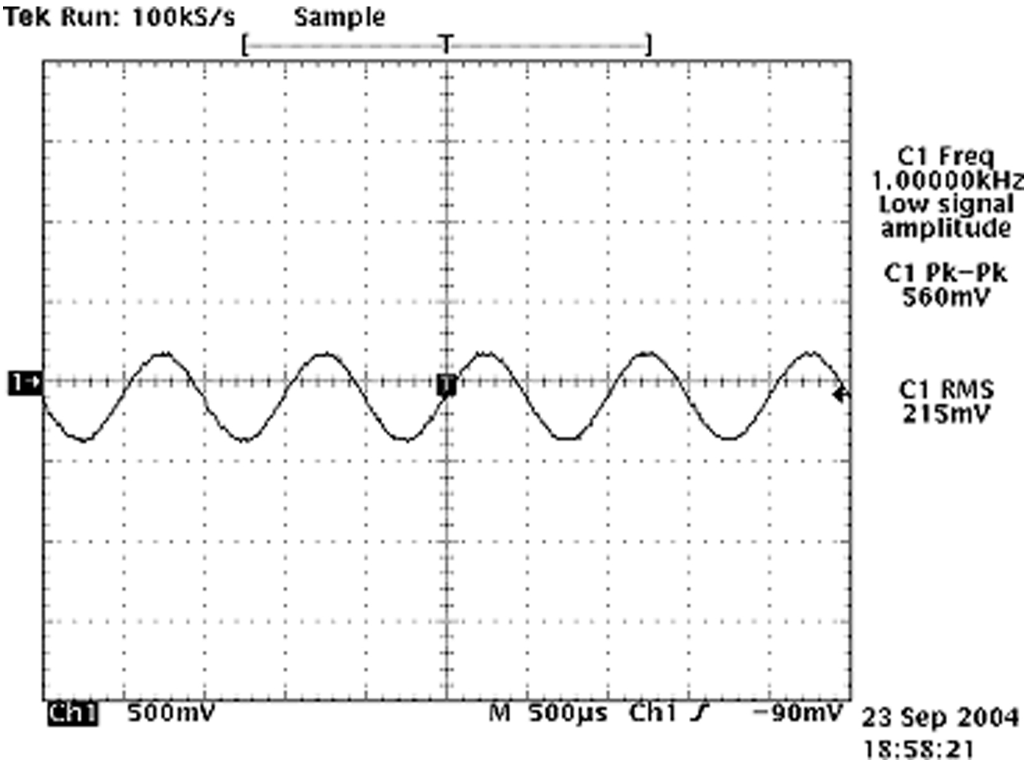


Figure 48 Single-ended output waveform of the Ext_in_HP_out measurement when earpiece is connected.



If a special low-pass filter designed for measuring digital amplifiers is unavailable, the measurement must be performed with a current probe and the input signal frequency must be 2kHz.

Figure 49 Differential output waveform of the Ext_in_IHF_out out loop measurement when speaker is connected.

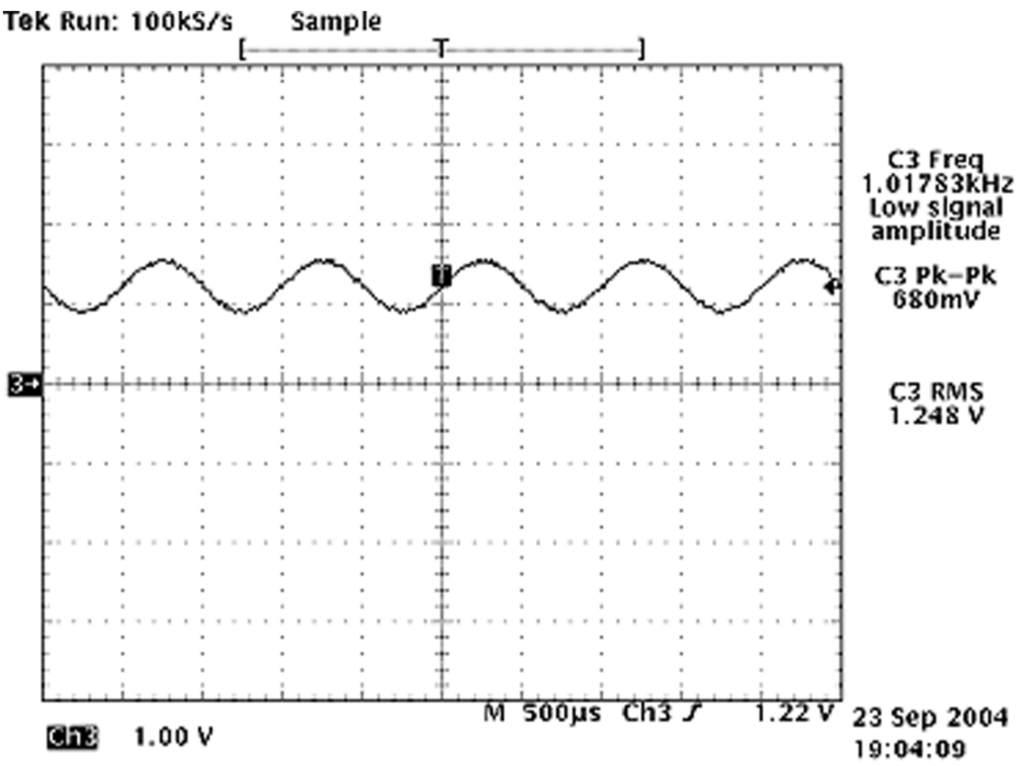
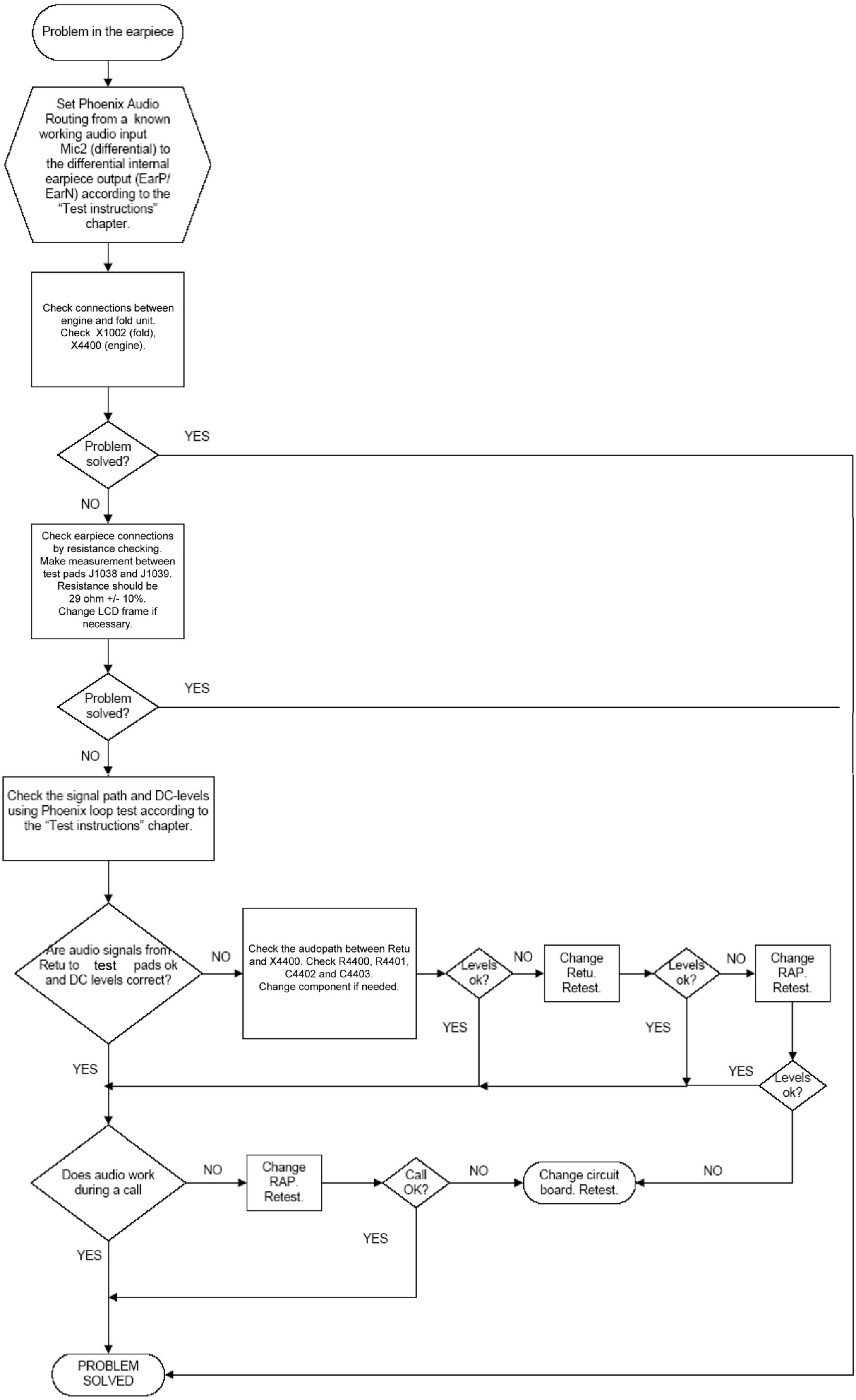


Figure 50 Single-ended output waveform of the HP_in_Ext_out loop when microphone is connected.

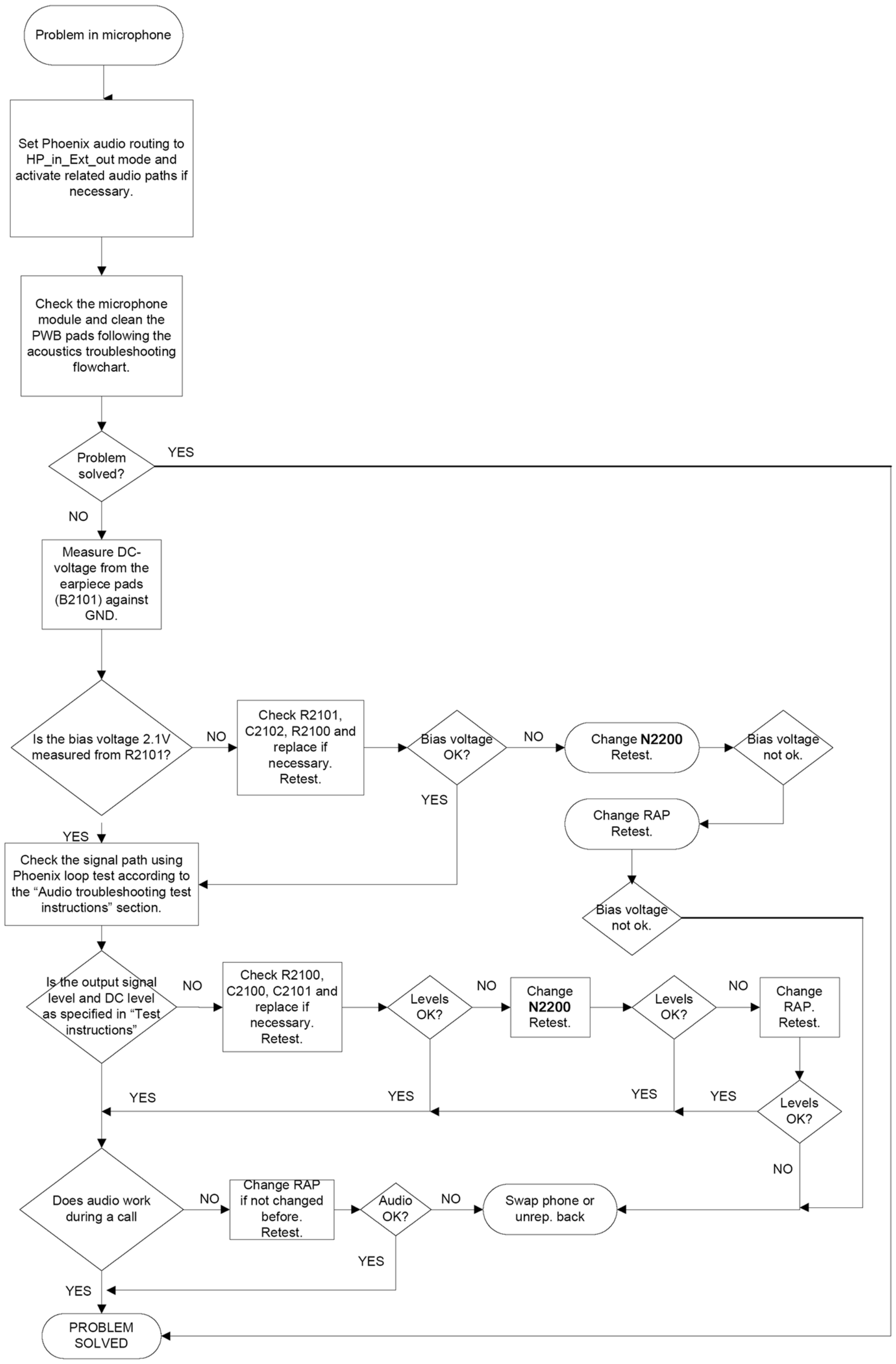
Internal earpiece troubleshooting

Troubleshooting flow


Problem in the earpiece
Set Phoenix Audio Routing from a known working audio input Mic2 (differential) to the differential internal earpiece output (EarP/ EarN) according to the "Test instructions" chapter.
Check connections between engine and fold unit. Check X1002 (fold), X4400 (engine).
Problem solved?
YES
NO
Check earpiece connections by resistance checking. Make measurement between test pads J1038 and J1039. Resistance should be 29 ohm +/- 10%. Change LCD frame if necessary.
Problem solved?
YES
NO
Check the signal path and DC-levels using Phoenix loop test according to the "Test instructions" chapter.
Are audio signals from Retu to test pads ok and DC levels correct?
NO
Check the audopath between Retu and X4400. Check R4400, R4401, C4402 and C4403. Change component if needed.
Levels ok?
NO
Change Retu. Retest.
Levels ok?
NO
Change RAP. Retest.
YES
YES
YES
Levels ok?
YES
Does audio work during a call
NO
Change RAP. Retest.
Call OK?
NO
Change circuit board. Retest.
NO
YES
YES
PROBLEM SOLVED

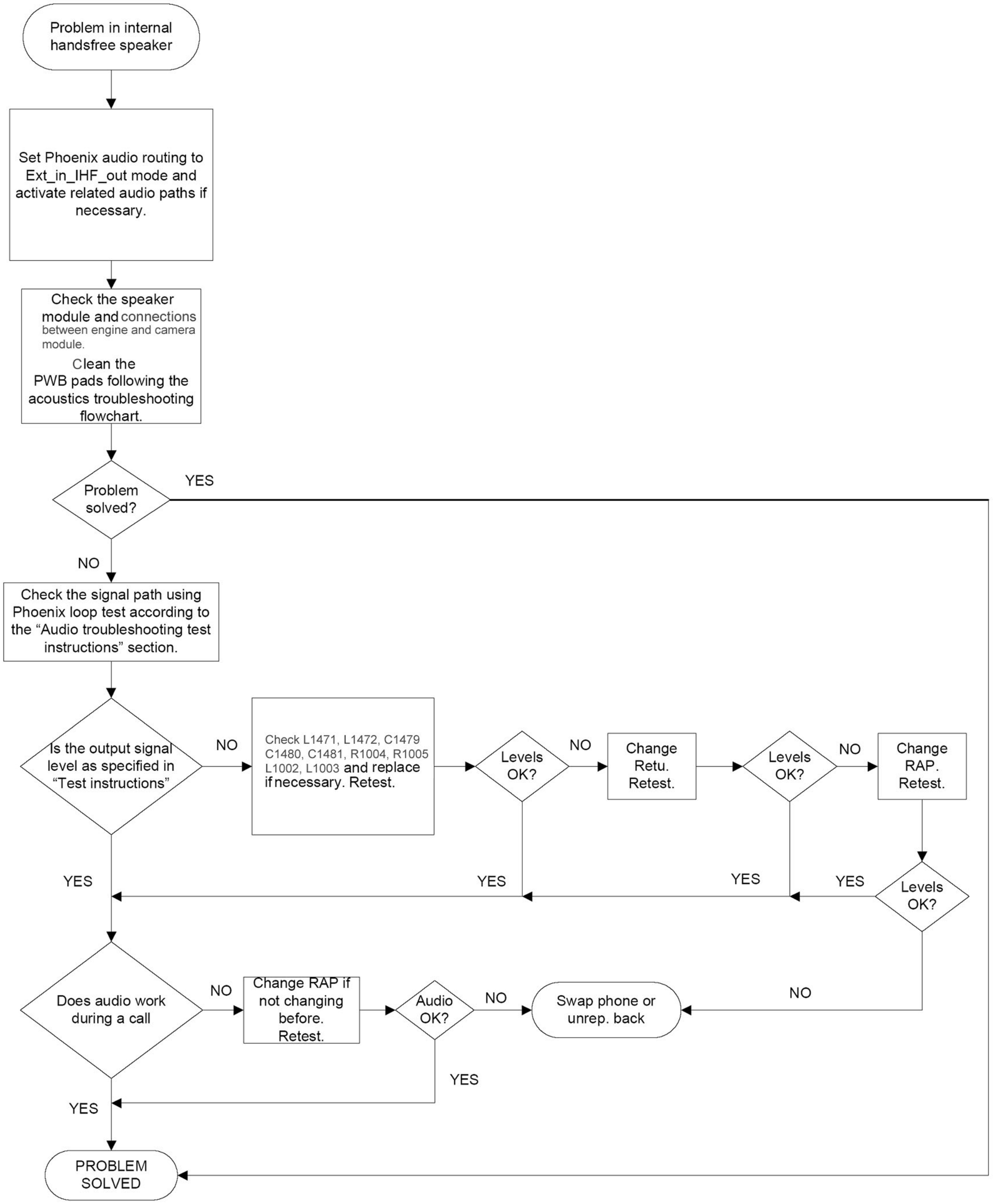
Internal microphone troubleshooting

Troubleshooting flow


Problem in microphone
Set Phoenix audio routing to HP_in_Ext_out mode and activate related audio paths if necessary.
Check the microphone module and clean the PWB pads following the acoustics troubleshooting flowchart.
Problem solved?
YES
NO
Measure DC-voltage from the earpiece pads (B2101) against GND.
Is the bias voltage 2.1V measured from R2101?
NO
Check R2101, C2102, R2100 and replace if necessary. Retest.
Bias voltage OK?
NO
Change N2200 Retest.
Bias voltage not ok.
YES
Change RAP Retest.
Bias voltage not ok.
YES
Check the signal path using Phoenix loop test according to the "Audio troubleshooting test instructions" section.
Is the output signal level and DC level as specified in "Test instructions"
NO
Check R2100, C2100, C2101 and replace if necessary. Retest.
Levels OK?
NO
Change N2200 Retest.
Levels OK?
NO
Change RAP. Retest.
Levels OK?
YES
YES
YES
YES
NO
Does audio work during a call
NO
Change RAP if not changed before. Retest.
Audio OK?
NO
Swap phone or unrep. back
YES
YES
PROBLEM SOLVED

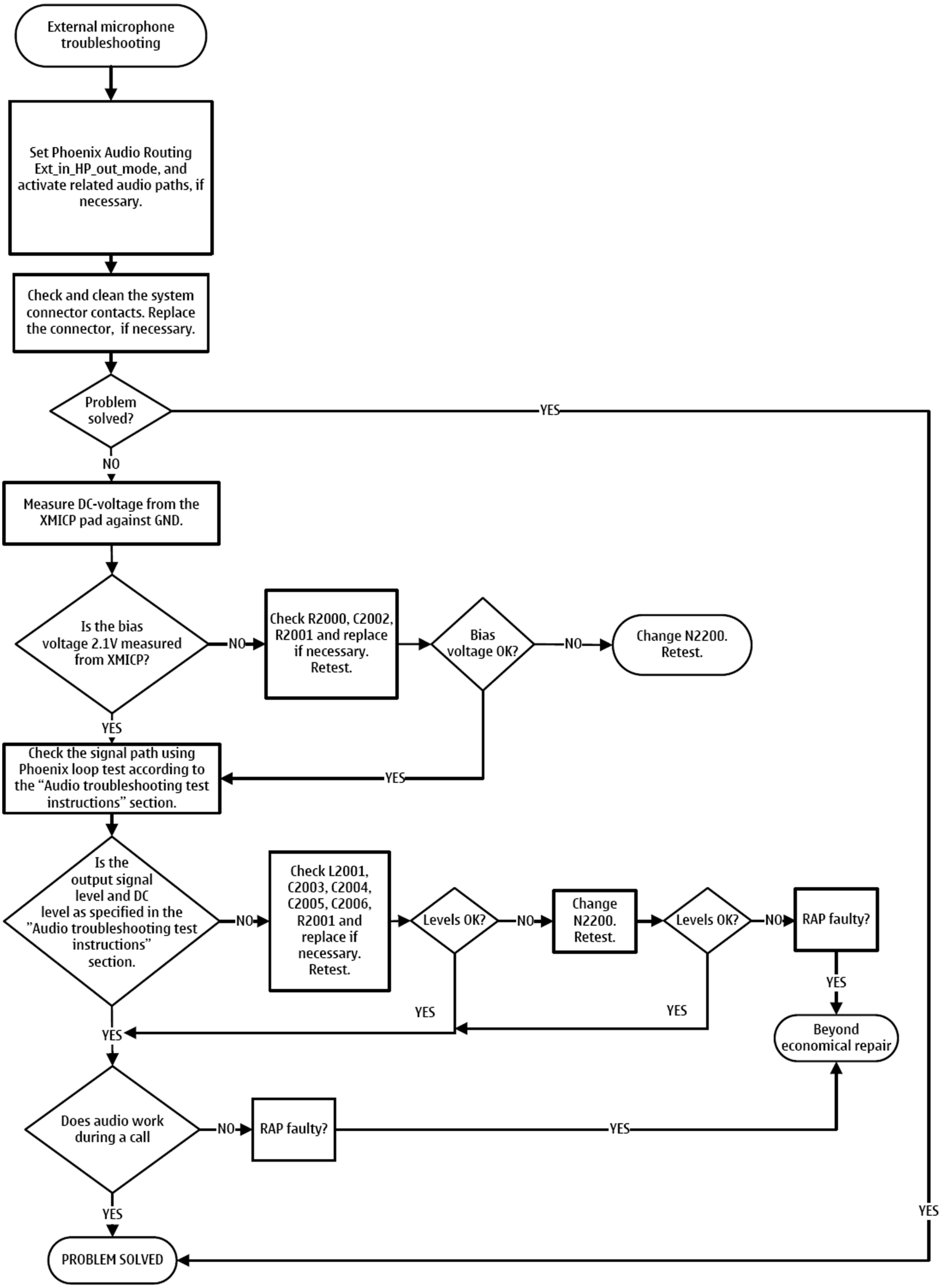
IHF troubleshooting

Troubleshooting flow


Problem in internal handsfree speaker
Set Phoenix audio routing to Ext_in_IHF_out mode and activate related audio paths if necessary.
Check the speaker module and connections between engine and camera module.
Clean the PWB pads following the acoustics troubleshooting flowchart.
Problem solved?
YES
NO
Check the signal path using Phoenix loop test according to the “Audio troubleshooting test instructions” section.
Is the output signal level as specified in “Test instructions”
NO
Check L1471, L1472, C1479 C1480, C1481, R1004, R1005 L1002, L1003 and replace if necessary. Retest.
Levels OK?
NO
Change Retu. Retest.
Levels OK?
NO
Change RAP. Retest.
Levels OK?
YES
YES
YES
YES
Does audio work during a call
NO
Change RAP if not changing before. Retest.
Audio OK?
NO
Swap phone or unrep. back
NO
YES
YES
PROBLEM SOLVED

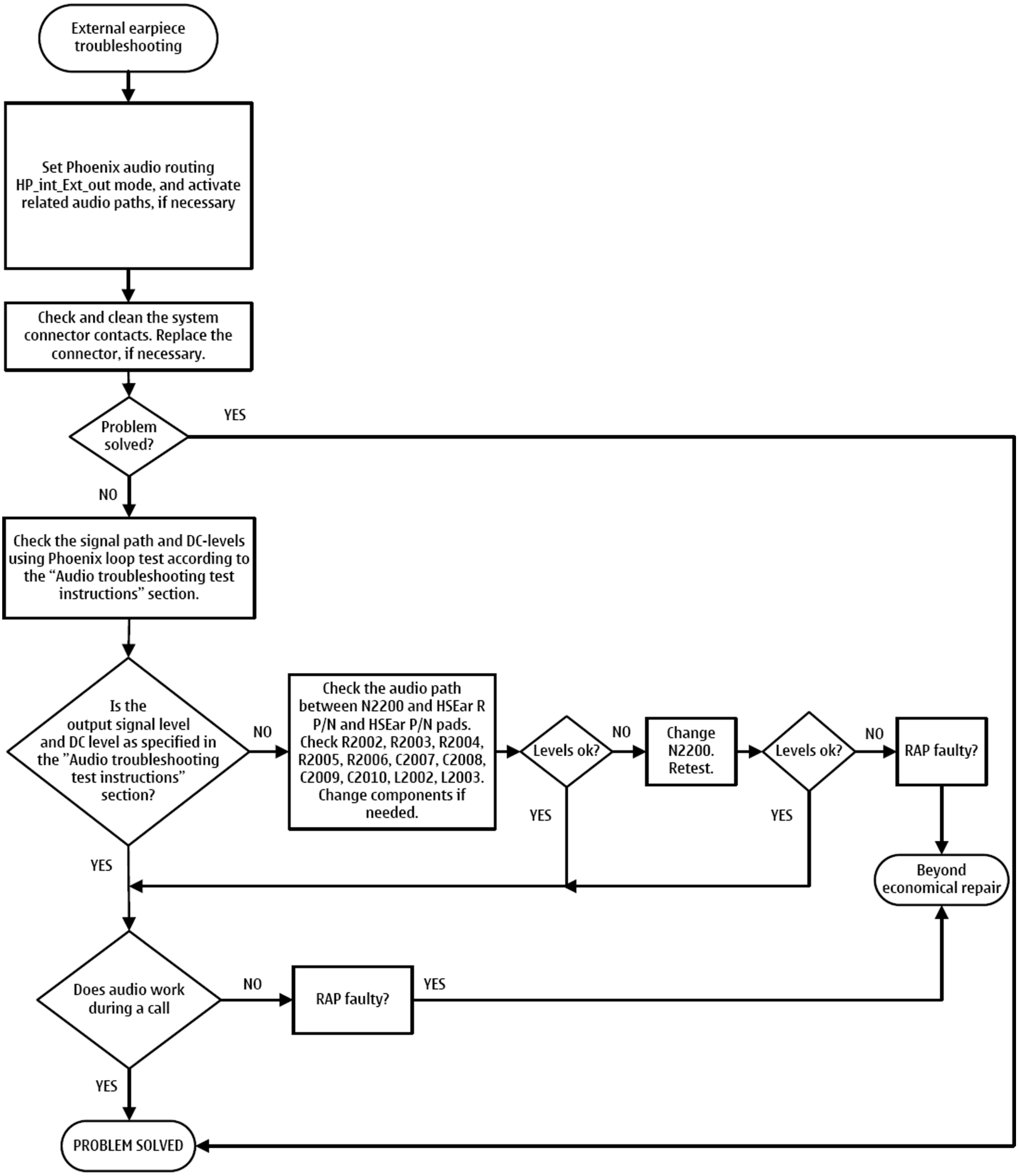
External microphone troubleshooting

Troubleshooting flow


External microphone troubleshooting
Set Phoenix Audio Routing Ext_in_HP_out_mode, and activate related audio paths, if necessary.
Check and clean the system connector contacts. Replace the connector, if necessary.
Problem solved?
YES
NO
Measure DC-voltage from the XMICP pad against GND.
Is the bias voltage 2.1V measured from XMICP?
NO
Check R2000, C2002, R2001 and replace if necessary. Retest.
Bias voltage OK?
NO
Change N2200. Retest.
YES
YES
Check the signal path using Phoenix loop test according to the "Audio troubleshooting test instructions" section.
Is the output signal level and DC level as specified in the "Audio troubleshooting test instructions" section.
NO
Check L2001, C2003, C2004, C2005, C2006, R2001 and replace if necessary. Retest.
Levels OK?
NO
Change N2200. Retest.
Levels OK?
NO
RAP faulty?
YES
Beyond economical repair
YES
YES
YES
Does audio work during a call
NO
RAP faulty?
YES
YES
YES
PROBLEM SOLVED

External earpiece troubleshooting

Troubleshooting flow


External earpiece troubleshooting
Set Phoenix audio routing HP_int_Ext_out mode, and activate related audio paths, if necessary
Check and clean the system connector contacts. Replace the connector, if necessary.
Problem solved?
YES
NO
Check the signal path and DC-levels using Phoenix loop test according to the "Audio troubleshooting test instructions" section.
Is the output signal level and DC level as specified in the "Audio troubleshooting test instructions" section?
NO
Check the audio path between N2200 and HSEar R P/N and HSEar P/N pads. Check R2002, R2003, R2004, R2005, R2006, C2007, C2008, C2009, C2010, L2002, L2003. Change components if needed.
Levels ok?
NO
Change N2200. Retest.
Levels ok?
NO
RAP faulty?
YES
YES
Beyond economical repair
YES
Does audio work during a call
NO
RAP faulty?
YES
YES
PROBLEM SOLVED

Baseband manual tuning guide

Energy management calibration

Before you begin

Energy Management (EM) calibration is performed to calibrate the setting (gain and offset) of AD converters in several channels (that is, **battery voltage**, **BSI**, **battery current**) to get an accurate AD conversion result.

Hardware setup:

- An external power supply is needed.
- Supply 12V DC from an external power supply to CU-4 to power up the phone.
- The phone must be connected to a CU-4 control unit with a product-specific flash adapter.

Steps

1. Place the phone to the docking station adapter (CU-4 is connected to the adapter).
2. Start *Phoenix* service software.
3. Choose **File→ Scan Product.**
4. Choose **Tuning→Energy Management Calibration.**
5. To show the current values in the phone memory, click **Read**, and check that communication between the phone and CU-4 works.
6. Check that the **CU-4 used** check box is checked.
7. Select the item(s) to be calibrated.

   Note: ADC calibration has to be performed before other item(s). However, if all calibrations are selected at the same time, there is no need to perform the ADC calibration first.

8. Click **Calibrate**.

   The calibration of the selected item(s) is carried out automatically.

   The candidates for the new calibration values are shown in the *Calculated values* column. If the new calibration values seem to be acceptable (please refer to the following "Calibration value limits" table), click **Write** to store the new calibration values to the phone permanent memory.

Table 11 Calibration value limits

Parameter	Min.	Max.
ADC Offset	-20	20
ADC Gain	12000	14000
BSI Gain	1100	1300
VBAT Offset	2400	2650
VBAT Gain	19000	23000
VCHAR Gain	N/A	N/A
IBAT (ICal) Gain	7750	12250

9. Click **Read**, and confirm that the new calibration values are stored in the phone memory correctly. If the values are not stored to the phone memory, click **Write** and/or repeat the procedure again.
10. To end the procedure, close the *Energy Management Calibration* window.

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7 — RF Troubleshooting and Manual Tuning Guide

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Introduction to RF troubleshooting

All measurements should be done using:

- spectrum analyser with a high-frequency high-impedance passive probe (LO-/reference frequencies and RF power levels)
- oscilloscope with a 10:1 probe (DC-voltages and low frequency signals)

> **Caution:** A mobile phone WCDMA transmitter should never be tested with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in wide area. WCDMA Tx measurements should be performed at least in an RF-shielded box and never with higher Tx power level than 0 dBm! Test full WCDMA Tx power only in RF-shielded environment.
>
> Also all measurements with an RF coupler should be performed in RF shielded environment because nearby base stations can disturb sensitive receiver measurements. If there is no possibility to use RF shielded environment, it should be checked that there are no transmissions on the same frequencies as used in the tests.

The RF section of the phone is build around two RF ASICS: Rx ASIC and Tx ASIC. There are also two PAs (Power Amplifiers) on board, one for GSM and another for WCDMA.

The WCDMA PA needs variable supply voltage to work properly, and therefore there is a switched mode power supply component added to the PWB. Please note that the grounding of the PA module is directly below the PA module. Therefore, it is difficult to check or change the module.

Most RF semiconductors are static discharge sensitive. ESD protection must be taken care of during repair (ground straps and ESD soldering irons). The RF ASICs, both PAs and SMPS are moisture sensitive, so parts must be pre-baked prior to soldering.

In addition to key components, there are lot of discrete components (resistors, inductors and capacitors) which troubleshooting is done mainly by checking if the soldering of the component is done properly.

A Capacitor can be checked for shorts and resistors for value by means of an ohmmeter, but be aware, in-circuit measurements should be evaluated carefully.

Keep in mind that all measured voltages or RF levels in the service manual are rough figures. Especially RF levels vary because of different measuring equipment or different grounding of the probe used. All spectrum analyser measurements in this manual are made with a Fluke PM9639/011 10:1 (500 ohm) probe. It is recommended that a similar kind of probe is used for all troubleshooting measurements.

When using an RF probe, use a pair of metallic tweezers to connect the probe ground to the PWB ground as close to the measurement point as possible. If measurements are performed in a product specific module jig, then “GND” pads should be used for the probe ground.

For additional RF troubleshooting instructions, see Appendix A. These instructions include descriptions/ instructions for RF self-tests as well as troubleshooting instructions for various fault cases.

RF key component placement

The RF section of the phone is build around two RF ASICs, Rx ASIC N7500 and Tx ASIC N7501.

There are also two PAs on the board, one for GSM (N7502) and one for WCDMA (N7503). The WCDMA PA needs variable supply voltage to work power efficiently and therefore there is a Switched Mode Power Supply (SMPS) component (N7504) added to the PWB.

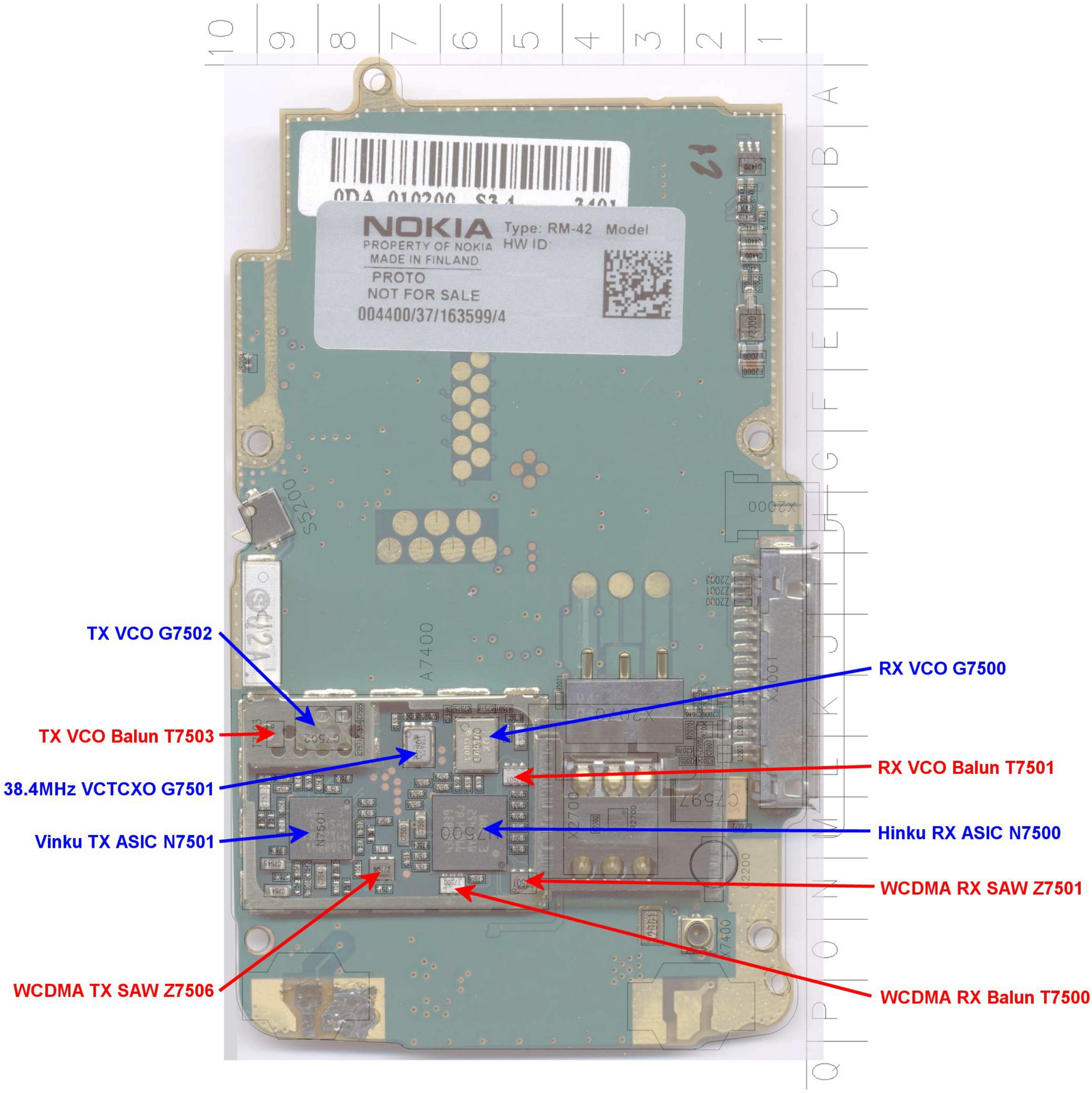

TX VCO G7502
TX VCO Balun T7503
38.4MHz VCTCXO G7501
Vinku TX ASIC N7501
WCDMA TX SAW Z7506
RX VCO G7500
RX VCO Balun T7501
Hinku RX ASIC N7500
WCDMA RX SAW Z7501
WCDMA RX Balun T7500
10
9
8
7
6
5
4
3
2
1
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q

Figure 51 RF key component placement, bottom

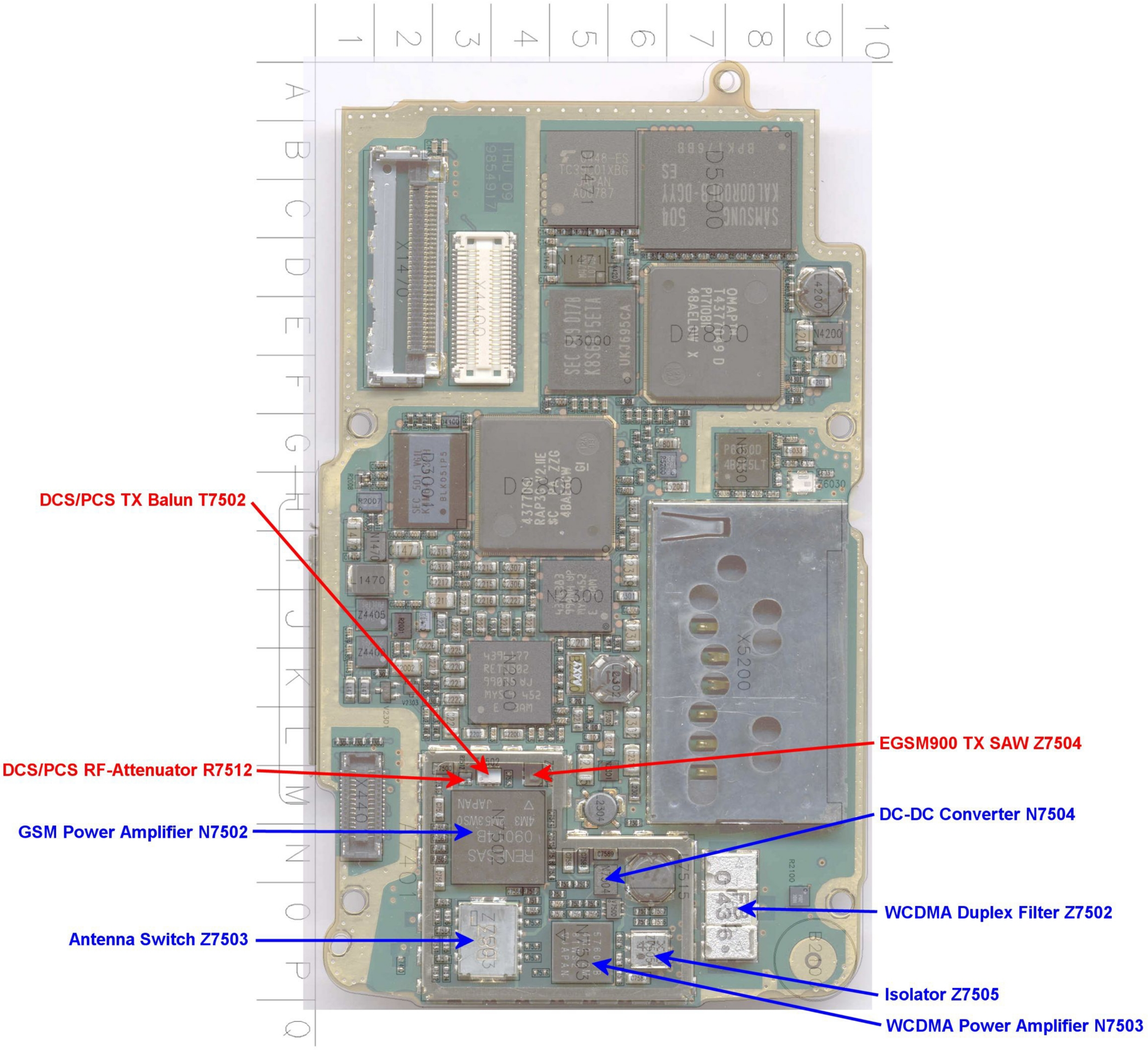

DCS/PCS TX Balun T7502
DCS/PCS RF-Attenuator R7512
GSM Power Amplifier N7502
Antenna Switch Z7503
EGSM900 TX SAW Z7504
DC-DC Converter N7504
WCDMA Duplex Filter Z7502
Isolator Z7505
WCDMA Power Amplifier N7503

Figure 52 RF key component placement, top

Fault finding test point locations

Test points for spectrum analyzer

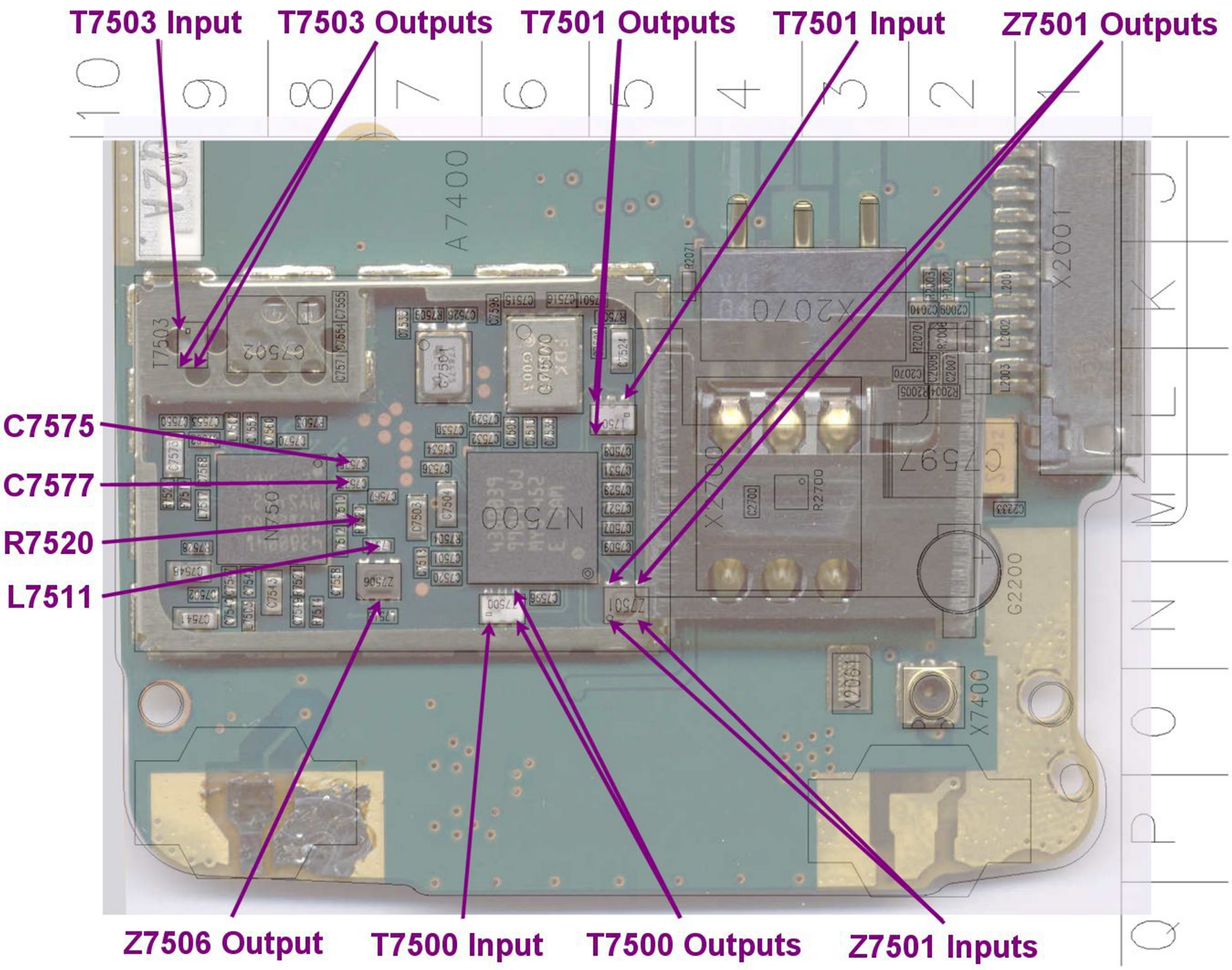

T7503 Input
T7503 Outputs
T7501 Outputs
T7501 Input
Z7501 Outputs
C7575
C7577
R7520
L7511
Z7506 Output
T7500 Input
T7500 Outputs
Z7501 Inputs
10
9
8
7
6
5
4
3
2
1
J
K
L
M
N
O
P
Q
A7400
N7500
X2070
X2700
X2001
X7400
G2200

Figure 53 Test point locations for spectrum analyzer, bottom

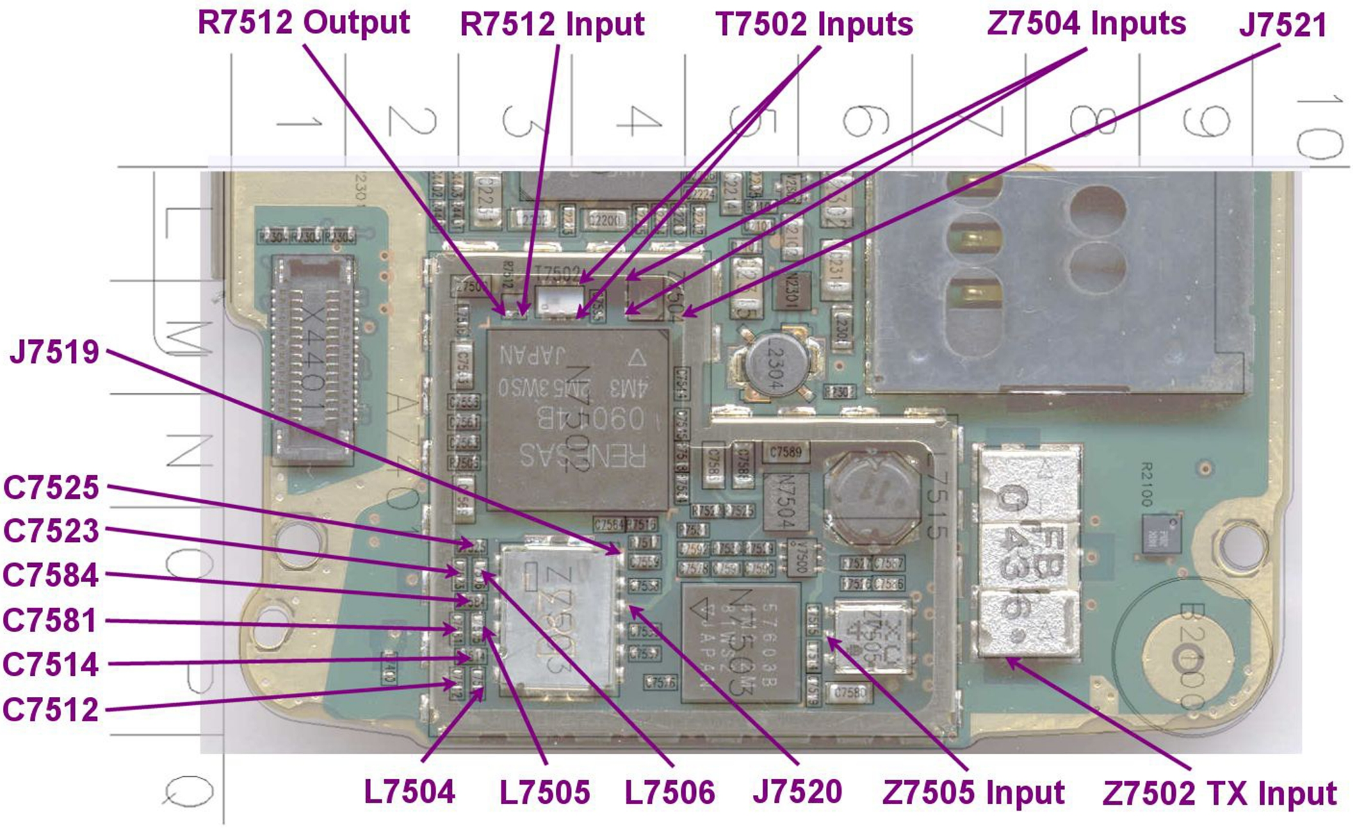

R7512 Output
R7512 Input
T7502 Inputs
Z7504 Inputs
J7521
J7519
C7525
C7523
C7584
C7581
C7514
C7512
L7504
L7505
L7506
J7520
Z7505 Input
Z7502 TX Input

Figure 54 Test point locations for spectrum analyzer, top

Test points for oscilloscope

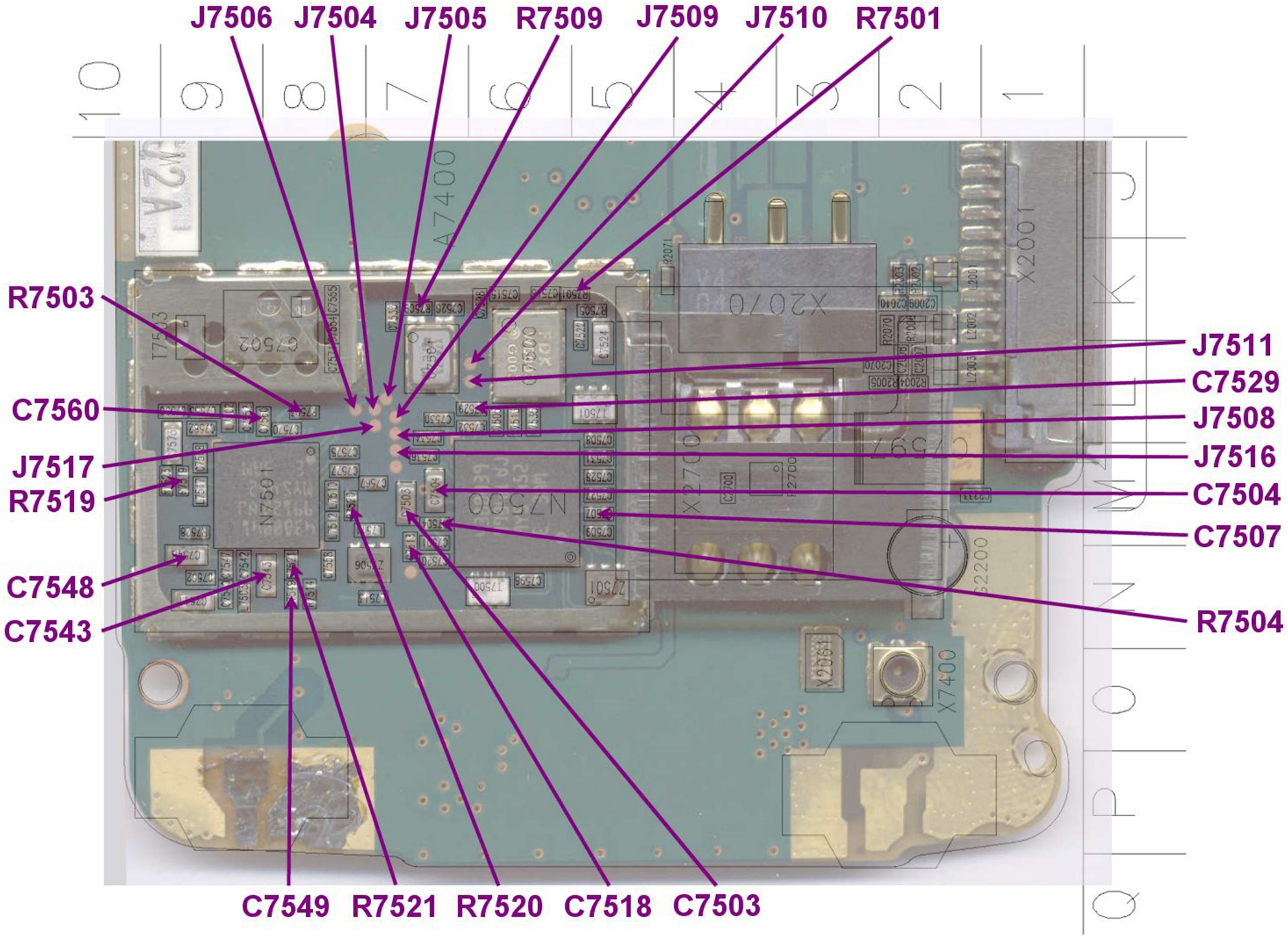

J7506
J7504
J7505
R7509
J7509
J7510
R7501
R7503
C7560
J7517
R7519
C7548
C7543
J7511
C7529
J7508
J7516
C7504
C7507
R7504
C7549
R7521
R7520
C7518
C7503

Figure 55 Test points for oscilloscope, bottom

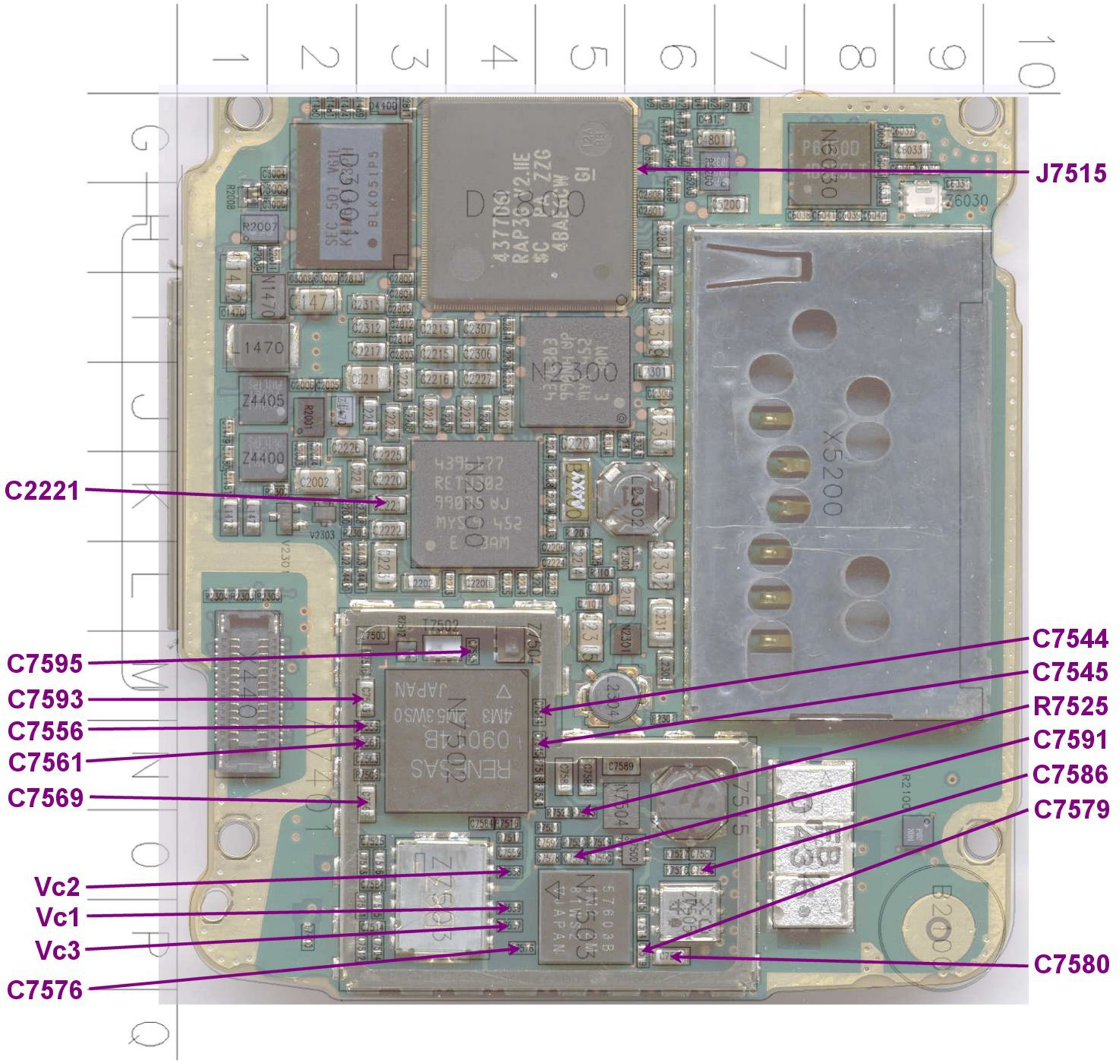

J7515
C2221
C7595
C7593
C7556
C7561
C7569
Vc2
Vc1
Vc3
C7576
C7544
C7545
R7525
C7591
C7586
C7579
C7580

Figure 56 Test points for oscilloscope, top

Receiver troubleshooting

Introduction to Rx troubleshooting

Rx can be tested by making a phone call or in the local mode. For the local mode testing, use Phoenix service software.

The main Rx troubleshooting measurement is RSSI measurement. This test measures the signal strength of the received signal. I and Q branches can be measured separately. For GSM RSSI measurement, see GSM Rx chain activation for manual measurements / GSM RSSI measurement (page 7–12), and for the same measurement in WCDMA, see WCDMA RSSI measurement (page 7–13).

In GSM, the input signal can be either a real GSM signal or a CW signal that is 67.771kHz up from the carrier frequency.

For service tool usage instructions, refer to section Service Tools and Service Concepts.

See also

- WCDMA Rx chain activation for manual measurement (page 7–12)

GSM Rx chain activation for manual measurements / GSM RSSI measurement

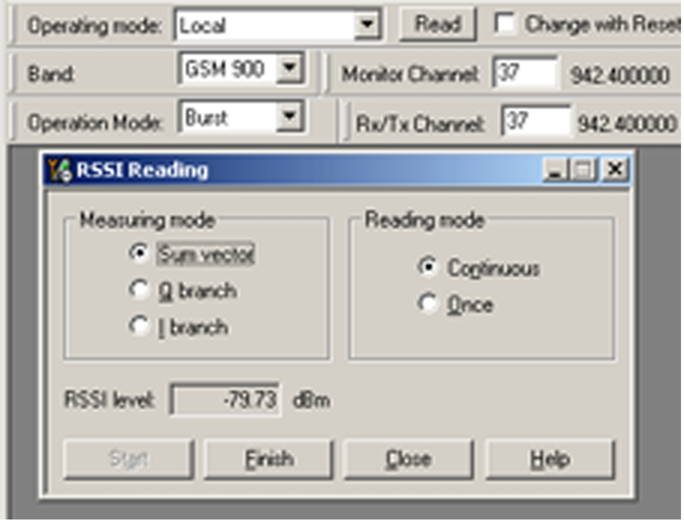
Context

RSSI signal measurement is the main Rx troubleshooting measurement. The test measures the strength of the received signal.

I and Q branches can be measured separately. In GSM, the input signal can be either real GSM signal or CW signal that is 67.771kHz up from the carrier frequency.

Steps

1. Start *Phoenix* service software.
2. From the Testing menu, choose GSM and RSSI Reading.
3. Setup RF signal generator for channel frequency +67.771kHz CW mode with –80dBm signal.
   Alternatively set cellular tester downlink channel to the appropriate channel.
4. In the RSSI Reading window, select the appropriate band and channel.



Operating mode: Local

☐ Change with Reset

Band: GSM 900

Monitor Channel: 37 942.400000

Operation Mode: Burst

Rx/Tx Channel: 37 942.400000

RSSI Reading

Measuring mode: ● Sum vector ○ Q branch ○ I branch

Reading mode: ● Continuous ○ Once

RSSI level: -79.73 dBm

Figure 57 RSSI Reading window

5. To start measurement/activate GSM Rx chain, click the Start button.

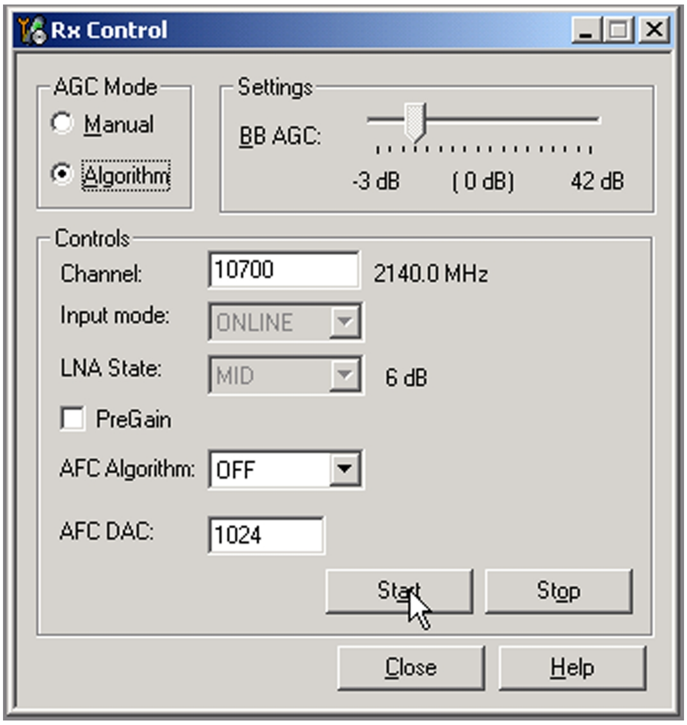
Results

RSSI reading values of the selected band and channel are displayed.

WCDMA Rx chain activation for manual measurement

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→WCDMA→Rx Control** .
3. In the *Rx Control* window:



AGC Mode: ○ Manual ● Algorithm

BB AGC: -3 dB (0 dB) 42 dB

Channel: 10700 2140.0 MHz

Input mode: ONLINE

LNA State: MID 6 dB

☐ PreGain

AFC Algorithm: OFF

AFC DAC: 1024

Figure 58 ***Rx Control*** **window**

- Set **AGC Mode** to **Algorithm**.
- Set **Channel** to **10700**.
- Set **AFC Algorithm** to **OFF** (Default = **OFF**).

Next action

When settings are ready, click **Start** to activate them.

If settings are changed later on (for example, you give a new channel number), you will need to click **Stop** and **Start** again.

> **Note:** Clicking **Stop** also disables **Tx Control** if that was active!

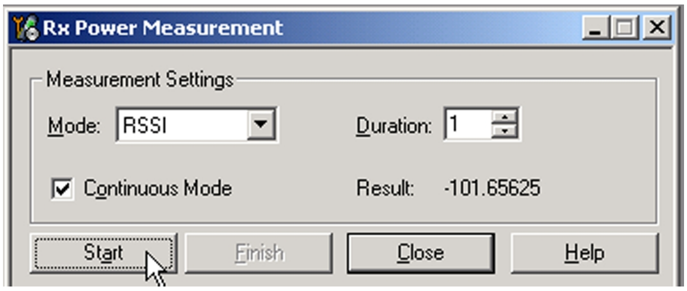
WCDMA RSSI measurement

Before you begin

WCDMA Rx must be activated before RSSI can be measured. See WCDMA Rx chain activation for manual measurement (page 7–12).

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→WCDMA→Rx Power Measurement** .
3. In the *Rx Power Measurement* window, choose the following settings:
   - Mode: RSSI
   - Continuous Mode



Measurement Settings

Mode: RSSI

Duration: 1

☑ Continuous Mode

Result: -101.65625

4. To perform the measurement, click **Start**.

Transmitter troubleshooting

General instructions for Tx troubleshooting

Context

- Do not transmit on frequencies that are in use!
- Transmitter can be controlled in the local mode for diagnostic purposes.
- The most useful Phoenix tool for GSM transmitter testing is "RF Controls" and in WCDMA transmitter testing the best tool is "Tx Control"..
- Tx IQ tuning and Tx power tuning can be also used in some cases.
- Remember that retuning is not a fix! Phones are tuned correctly in production.

The first set of steps instructs how to assemble the test setup. This setup is general for all Tx troubleshooting tasks.

Alternative steps provide specific troubleshooting instructions for *Phoenix* service software. The first section is for the EGSM900/GSM1800/GSM1900 bands and the latter for WCDMA.

> **Caution:** Never activate the GSM or WCDMA transmitter without a proper antenna load. There should be always 50 ohm load connected to the RF connector (antenna, RF-measurement equipment or at least 2 watts dummy load), otherwise GSM or WCDMA PA may be damaged.

Steps

1. Connect a test jig to a computer with a DAU-9S cable or to a FPS-8 flash prommer with a modular cable.

   Make sure that you have a PKD-1 dongle connected to the computer's parallel port.
2. Connect a DC power supply to a module jig (MJ-48).

   > **Note:** When repairing or tuning a transmitter, use an external DC supply with at least 3 A current capability.
   >
   > Set the DC supply voltage to 3.9 V and set the jumper connector on the test jig's **reg.pass** switch to “ON” position.
3. Connect an RF cable between the RF connector of the module test jig (MJ-48) and measurement equipment or alternatively use a 50 ohms (at least 2 W) dummy load in the module test jig RF connector, otherwise GSM or WCDMA PA may be damaged.

   > **Note:** There are three antenna connectors in the module jig:
   >
   > - one for GSM
   > - one for WCDMA
   > - one for Bluetooth
   >
   > Make sure that all connections are made to the correct RF connector.

   Normally a spectrum analyser is used as measurement equipment.

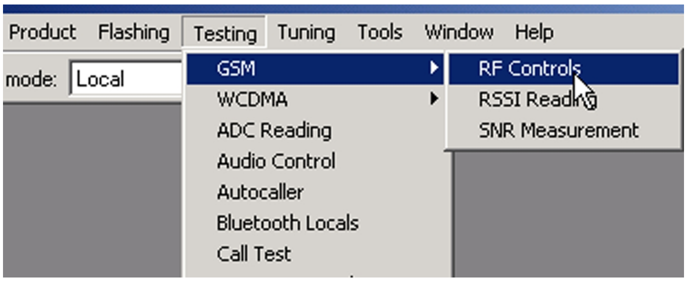
Note: The maximum input power of a spectrum analyser is +30 dBm.

To prevent any damage, it is recommended to use 10 dB attenuator on the spectrum analyzer input.

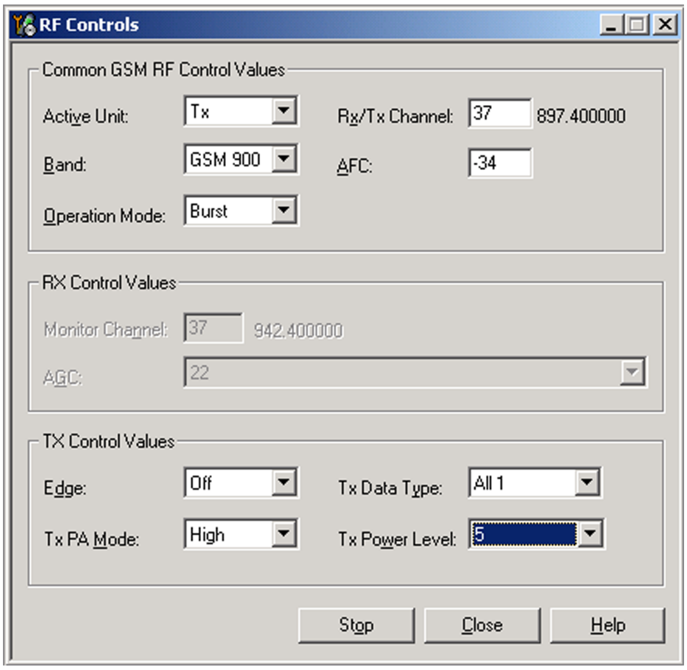
4. Set Tx on.
   - i Set the phone module to the test jig and start *Phoenix service software*.
   - ii Initialize connection to the phone. (With FPS-8 use FBUS driver when using DAU-9S and COMBOX driver).
   - iii From the File menu, choose product: **File -> Choose Product -> xx-x*** (* = type designator of the phone).
   - iv From the toolbar, set operating mode to "Local".

Alternative steps

- EGSM900/DCS1800/PCS1900 troubleshooting
  - i From the Testing menu, activate the *RF Controls* window:
    Maintenance -> Testing -> GSM -> RF Controls .


Product
Flashing
Testing
Tuning
Tools
Window
Help
mode:
Local
GSM
WCDMA
ADC Reading
Audio Control
Autocaller
Bluetooth Locals
Call Test
RF Controls
RSSI Reading
SNR Measurement

  - ii In the *RF Controls* window:
    - Select band "GSM900" or "GSM1800" or "GSM1900" (Default = "GSM900").
    - Set Active unit to "Tx" (Default = "Rx").
    - Set Operation mode to "Burst" (Default = "Burst").
    - Set Tx data type to "All1" (Default = "All1").
    - Set Rx/Tx channel to 37 on GSM900 band or 700 on GSM1800 band or 661 on GSM1900 (Defaults).
    - Set Edge to "Off" (Default).
    - Set Tx PA mode to "Free" (Default).
    - Set power level to 5 (Default = 19) on GSM900 or to 0 (Default = 15) on GSM1800 or GSM1900.


RF Controls

Common GSM RF Control Values

Active Unit: Tx
Band: GSM 900
Operation Mode: Burst
Rx/Tx Channel: 37 897.400000
AFC: -34

RX Control Values

Monitor Channel: 37 942.400000
AGC: 22

TX Control Values

Edge: Off
Tx PA Mode: High
Tx Data Type: All 1
Tx Power Level: 5

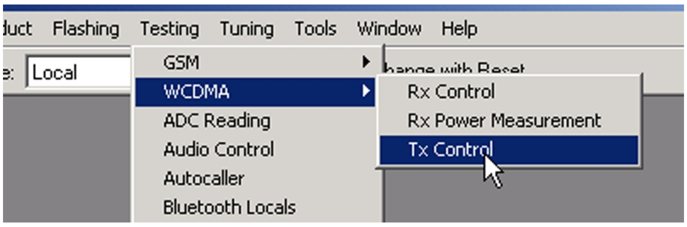
Stop
Close
Help

Figure 59 RF Controls window

- WCDMA troubleshooting

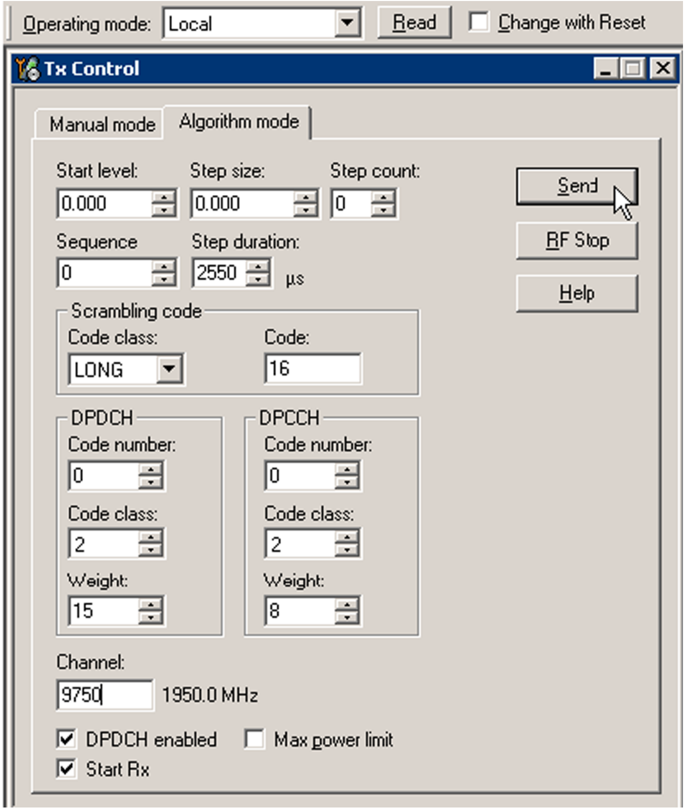
  i From Product/System Mode menu, choose "WCDMA" to Selected System Mode and click Write

  ii From the Testing menu, activate the *Tx Control* window: **Maintenance -> Testing -> WCDMA -> Tx Control** .


luct
Flashing
Testing
Tuning
Tools
Window
Help
Local
GSM
WCDMA
ADC Reading
Audio Control
Autocaller
Bluetooth Locals
hange with Reset
Rx Control
Rx Power Measurement
Tx Control

  iii In the *Tx Control* window:

  - Select the *Algorithm mode* tab.
  - Set Start level to “0” dBm (Default = “0”).
  - Set Step size, Step count and Sequence to “0” (Default = “0”).
  - Set Scrambling code class to “LONG” (Default = “LONG”).
  - Set Scrambling code to “16” (Default = “16”).
  - Set DPDCH Code number to “0”, Code class to “2” and Weight to “15” (Defaults).
  - Set DPCCH Code number to “0”, Code class to "2" and Weight to “8” (Defaults).
  - Set DPDCH enabled (Default).
  - Set Channel to 9750.



Operating mode: Local

☐ Change with Reset

Start level: 0.000

Step size: 0.000

Step count: 0

Sequence: 0

Step duration: 2550 µs

Scrambling code

Code class: LONG

Code: 16

DPDCH

Code number: 0

Code class: 2

Weight: 15

DPCCH

Code number: 0

Code class: 2

Weight: 8

Channel: 9750 1950.0 MHz

☑ DPDCH enabled ☐ Max power limit

☑ Start Rx

Figure 60 Tx Control window

Next action

When settings are done, click “Send” to enable them.

If you change the settings (e.g. give a new channel number), you need to click “Stop” and “Send” again.

Checking antenna functionality

The main antenna has two separate antenna elements: GSM and WCDMA antennas.

In the GSM antenna, there is one Feed and two GND contacts.

In the WCDMA antenna, there is one Feed and one GND contact.

The GSM and WCDMA antenna contacts are directly coupled together ie. DC resistance between the feed and ground connection is about zero ohms.

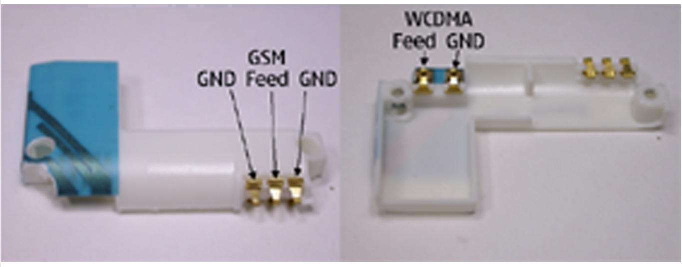


Figure 61 Antenna frame, contact springs and WCDMA antenna

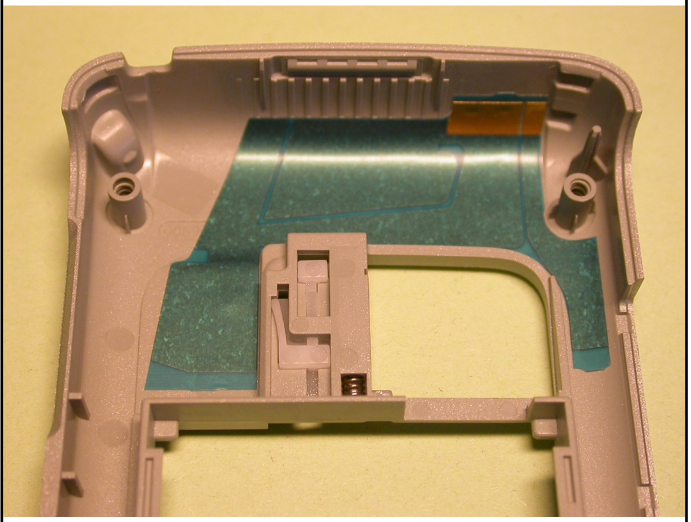
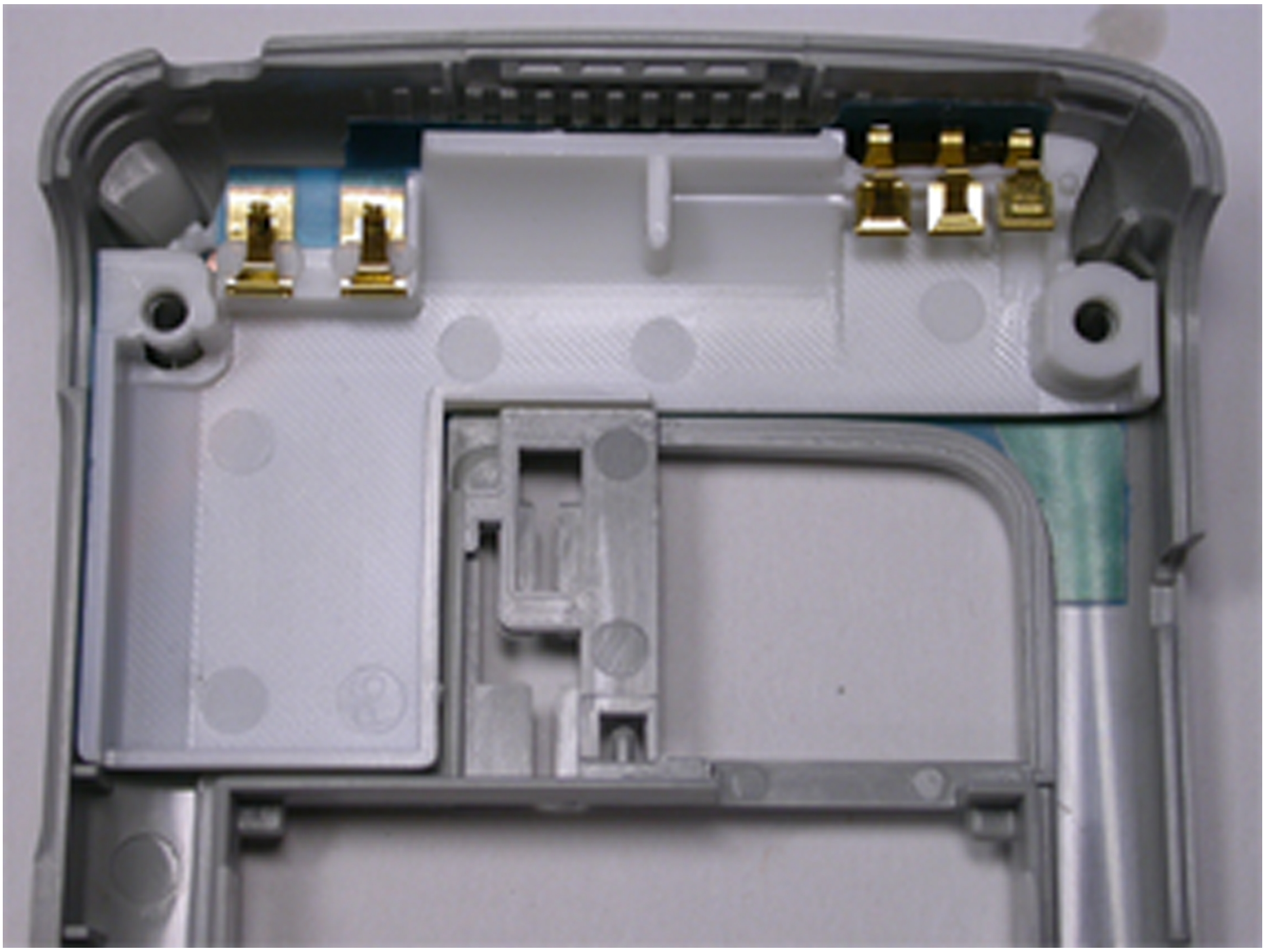


Figure 62 GSM antenna radiator

The WCDMA antenna is working correctly when it is visually intact and DC resistance between the contact springs is about zero ohms. The GSM antenna works when the flex film is intact and contact springs are assembled in the frame as figures above and below show.



Bluetooth antenna

Bluetooth antenna is a ceramic chip antenna assembled on the engine PWB. The antenna is working properly if it has been assembled in correct position and if solder joints of the antenna are all right and the antenna is intact.

RF tunings

Introduction to RF tunings

Phone RF is tuned in production. There is no reason to do the re-calibration unless:

- One or more of the RF components is changed
- FLASH Memory chip (D3000) is changed or otherwise corrupted.

RF calibration is always performed with the help of module jig MJ-48. Whenever possible, automatic tuning system should be used.

If manual tuning is used, only relevant tunings should be performed. Refer to the table below:

Changed component	Perform following tunings
Tx RF ASIC Vinku (N7501)	RF Channel Filter Calibration, Tx IQ Tuning, Tx Power Level Tuning, Temperature Sensor Calibration, TX AGC & Power Detector, Tx Band Response Calibration, Tx LO Leakage
RX RF ASIC Hinku (N7500)	RF Channel Filter Calibration, Rx Calibration, Rx Band Filter Response Compensation, Rx AM Suppression, Rx AGC Alignment, Rx Band Response Calibration
Any component in the GSM TX RF chain before the PA	Tx IQ Tuning, Tx Power Level Tuning
Any component in the GSM TX RF chain after the PA or PA	Tx Power Level Tuning
Any component in the WCDMA TX RF chain before the PA	Tx AGC & Power Detector, Tx Band Response Calibration, Tx LO Leakage
Any component in the WCDMA TX RX chain after the PA, PA, power detector or PA switch mode power supply	Tx AGC & Power Detector, Tx Band Response Calibration, PA Detection
Any component in the GSM RX chain	Rx Calibration, RX Band Filter Response Compensation, RX AM Suppression
Any component in the WCDMA RX chain	Rx AGC Alignment, RX Band Response Calibration

Cable and adapter losses

RF cables and adapters have some losses. They have to be taken in account when the phone is tuned. As all the RF losses are frequency dependent, the user have to be very careful and understand the measurement setup. Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. In the following table there are RF attenuations of the module jig, MJ-48:

Band	Attenuation
GSM900	0.1 dB

Band	Attenuation
GSM1800	0.2 dB
GSM1900	0.2 dB
WCDMA TX WCDMA RX	0.3 dB 0.4 dB

RF autotuning with CMU200

Before you begin

Recommended test set-up:

- Windows 2000 PC
- CMU200 communication tester
- USB to GPIB converter from National Instruments. Order information: 778416-01 GPIB-USB-B, NI-488.2 for Windows 2000/XP/Me/98.

Before you can use the auto-tune feature, the GPIB driver from the GPIB card vendor must be installed and running.

Then the auto tune **.ini** file must be in a correct place: **C:\Program Files\Nokia\Phoenix\products\xx-x*\autotune_xx-x*.ini** (**= indicates the type designator of the phone, e.g. RM-42*)

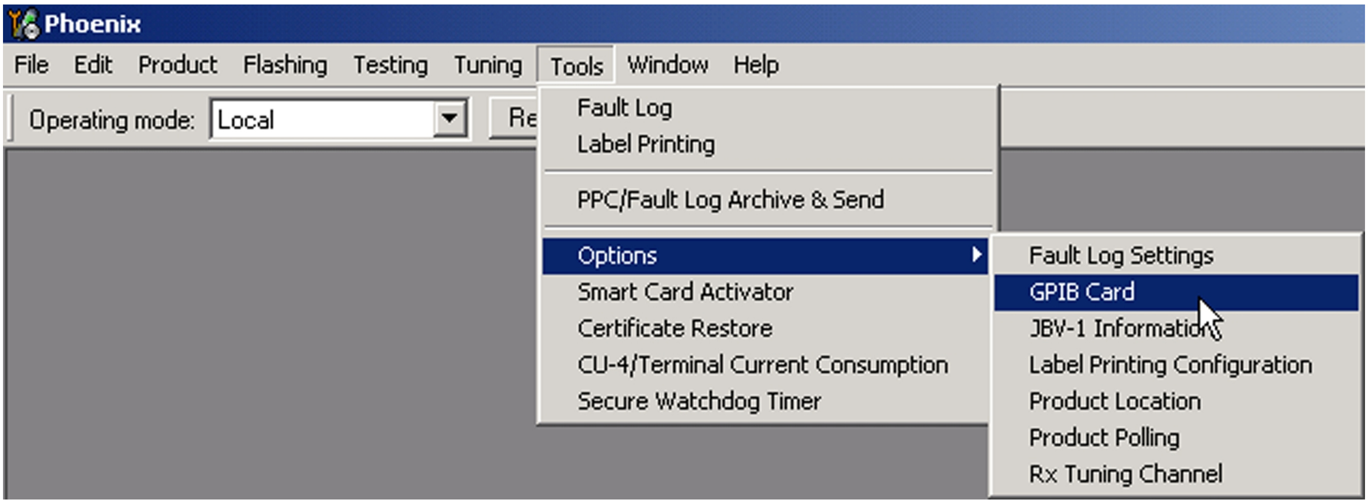
Context

It is possible to perform an automatic RF tuning with the aid of CMU200. Autotuning covers all RF tunings that are needed to perform after RF component repairs.

> **Note:** Do not perform RF autotuning "just for sure". Phones are tuned in the production and RF tuning may performed only after component repairs or if the RF tuning information is lost.

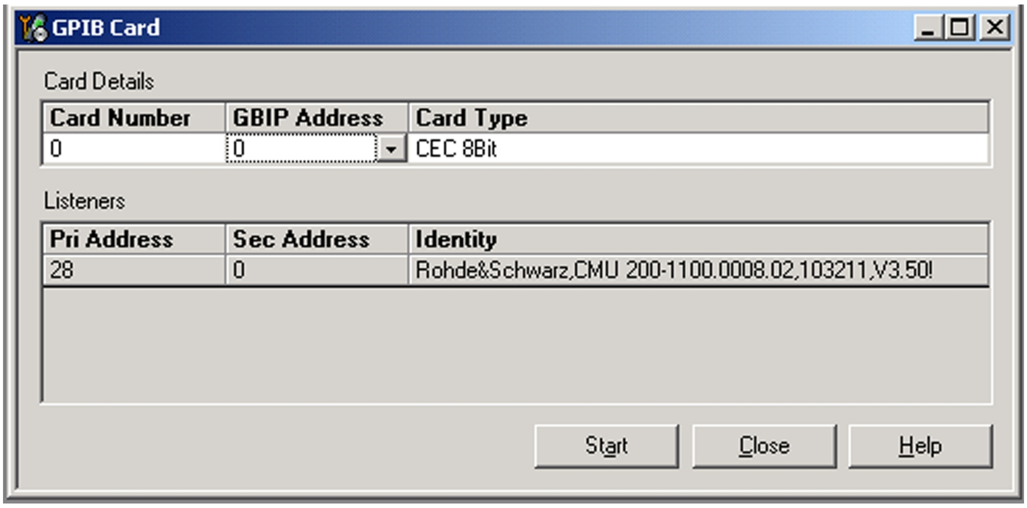
Steps

1. Connect CMU200 to the GPIB bus.
2. From the Tools menu in Phoenix, choose Options -> GPIB Card.


Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
Operating mode:
Local
Re
Fault Log
Label Printing
PPC/Fault Log Archive & Send
Options
Smart Card Activator
Certificate Restore
CU-4/Terminal Current Consumption
Secure Watchdog Timer
Fault Log Settings
GPIB Card
JBV-1 Information
Label Printing Configuration
Product Location
Product Polling
Rx Tuning Channel

3. In the Card Type line, select CEC8Bit, then click Start.

   After clicking Start, the name of the CMU200 communication tester appears in the list of found Listeners.


GPIB Card
Start
Close
Help

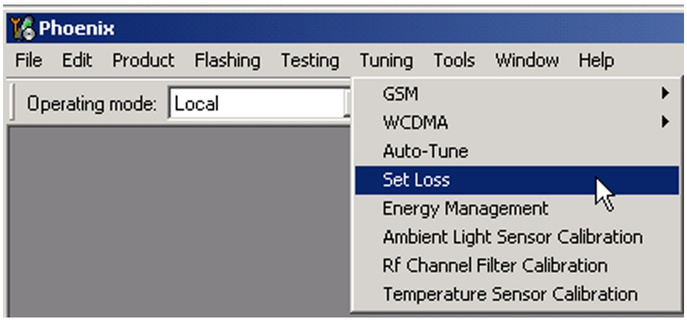
Card Details

Card Number	GBIP Address	Card Type
0	0	CEC 8Bit

Listeners

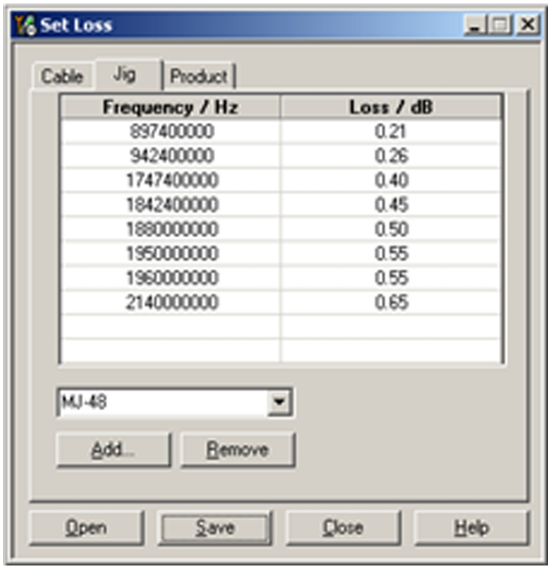
Pri Address	Sec Address	Identity
28	0	Rohde&Schwarz,CMU 200-1100.0008.02,103211,V3.50!

4. To specify the cable loss from module jig to CMU200, choose Set Loss from the Tuning menu.


Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
RF Channel Filter Calibration
Temperature Sensor Calibration

Operating mode: Local

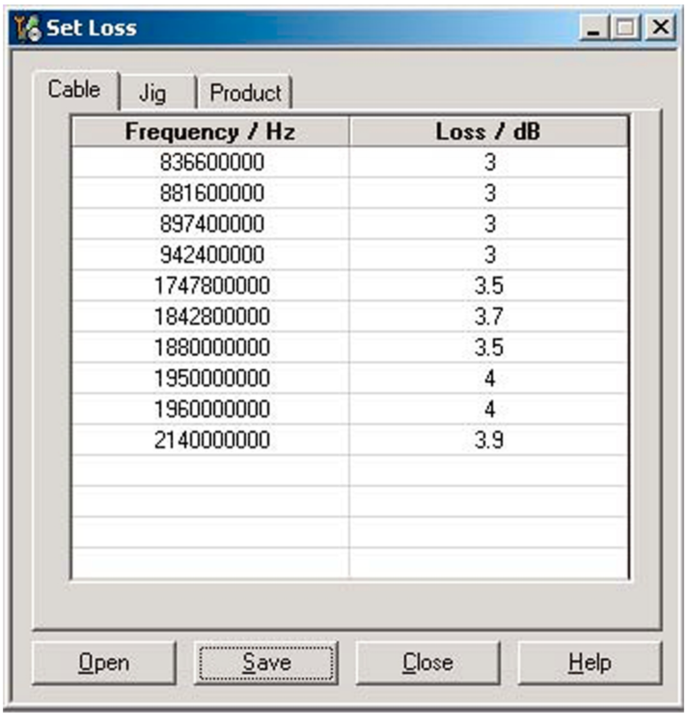
5. In the Set Loss window, click the Jig tab and select the right jig for the phone.


Set Loss
Cable
Jig
Product
Add...
Remove
Open
Save
Close
Help

Frequency / Hz	Loss / dB
897400000	0.21
942400000	0.26
1747400000	0.40
1842400000	0.45
1880000000	0.50
1950000000	0.55
1960000000	0.55
2140000000	0.65

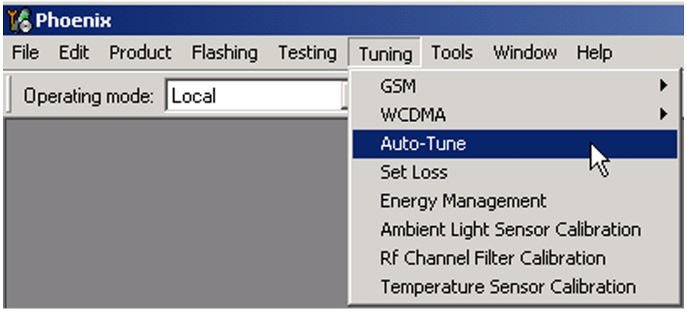
MJ-48

6. Click the Cable tab and add the extra cable attenuation.


Set Loss
Cable
Jig
Product
Open
Save
Close
Help

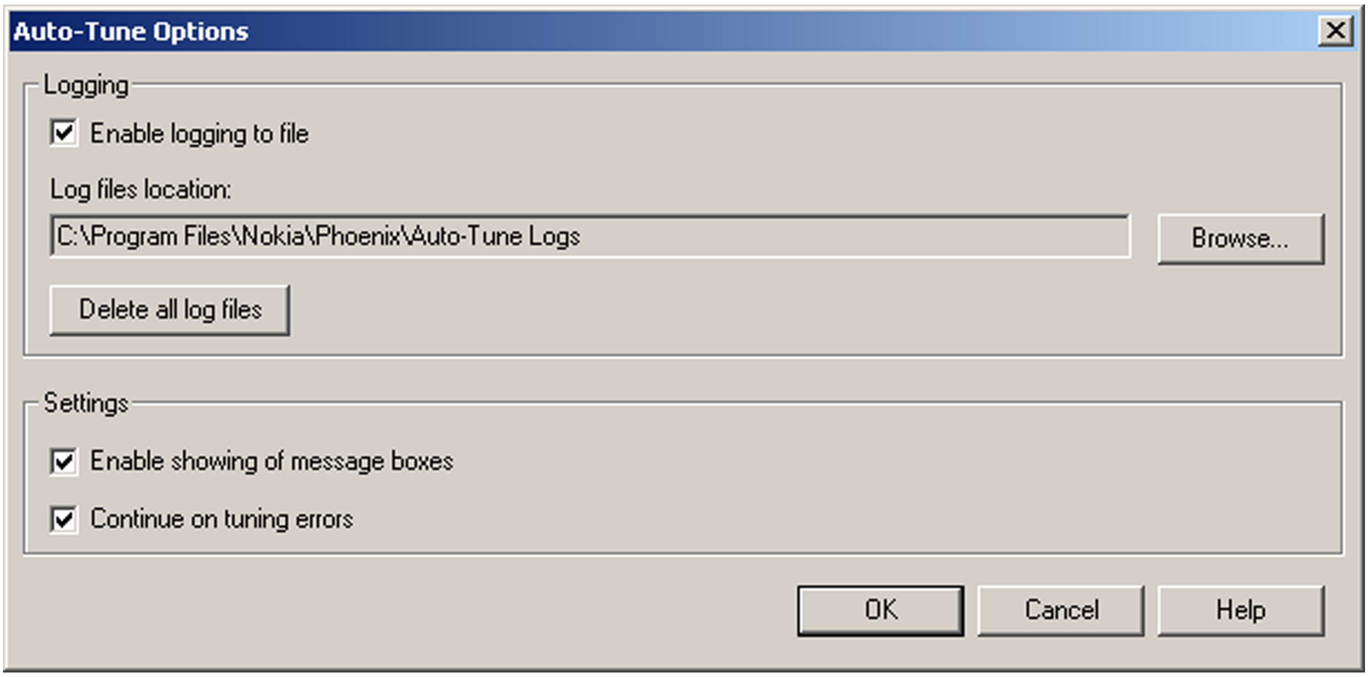
Frequency / Hz	Loss / dB
836600000	3
881600000	3
897400000	3
942400000	3
1747800000	3.5
1842800000	3.7
1880000000	3.5
1950000000	4
1960000000	4
2140000000	3.9

7. To start autotuning, choose Auto-Tune from the Tuning menu.


Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
RF Channel Filter Calibration
Temperature Sensor Calibration

Operating mode: Local

8. In the Auto-Tune window, click Options.
9. In the Auto-Tune options window, see that the "Enable showing of messages" check box is checked. Then click OK.



Auto-Tune Options

Logging

☑ Enable logging to file

Log files location:

C:\Program Files\Nokia\Phoenix\Auto-Tune Logs

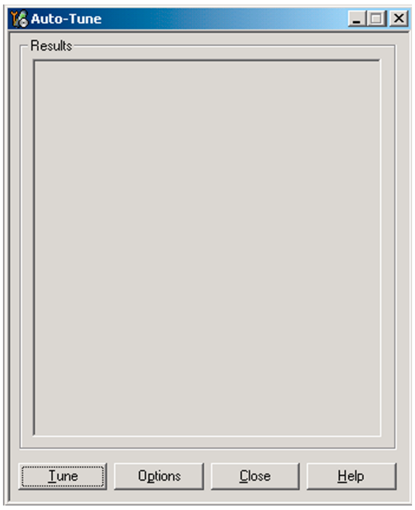
Settings

☑ Enable showing of message boxes

☑ Continue on tuning errors

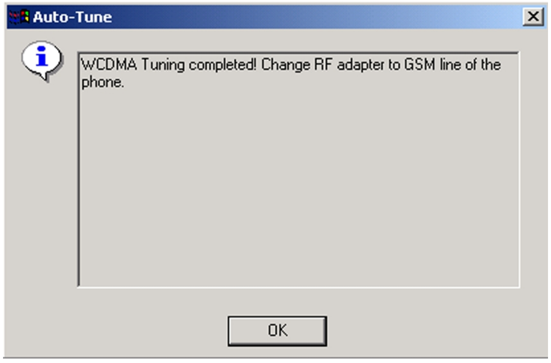
Browse...
Delete all log files
OK
Cancel
Help

10. Connect the phone's WCDMA RF port to CMU200 and click Tune.



Auto-Tune
Results
Tune
Options
Close
Help

11. Change the phone's RF adapter from WCDMA port to GSM port. Then to complete the RF autotuning, click OK.

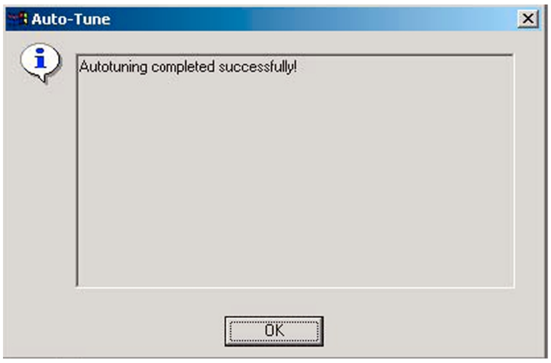


Auto-Tune

WCDMA Tuning completed! Change RF adapter to GSM line of the phone.

Results

"Autotuning completed successfully" message appears.



Autotuning completed successfully!

System mode independent manual tunings

RF channel filter calibration

Context

Rx channel filter calibration tunes Rx and Tx ASICs' internal low pass filters that limit the bandwidth of BB IQ signals.

One common calibration is made for GSM and WCDMA.

Table 12 RF channel filter calibration tuning limits

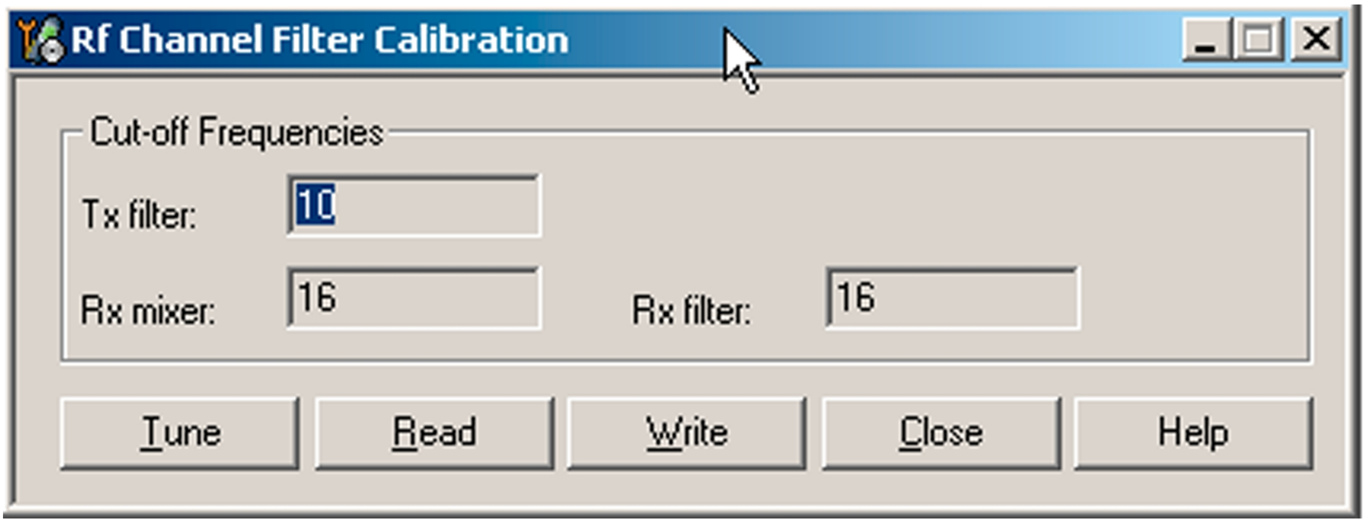
	Min	Typ	Max
TX filter	0	10	31
RX filter	0	16	31

Steps

1. From the dropdown menus, set "Operating mode" to Local.
2. From the Product menu, choose "System mode" and then choose WCDMA, GSM or Dual and click Write.
3. From the Tuning menu, choose *RF Channel Filter Calibration*.
4. Click Tune.
5. Click Write.

   Saves tuned values to the PMM area.
6. To close the tuning window, click Close.

Results



Tx filter: 10

Rx mixer: 16

Rx filter: 16

Figure 63 RF channel filter calibration typical values

PA detection

Context

PA detection procedure asks DSP to detect which PA manufacturer is used for GSM and WCDMA PAs.

If PA is changed or if PMM data is corrupted, PA detection has to be performed before Tx tunings.

Steps

1. From the dropdown menus, set "Operating mode" to Local.
2. From the Product menu, choose "System mode" and then choose WCDMA, GSM or Dual and click Write.
3. From the Tuning menu, choose PA Detection.
4. Click Tune.
5. Check that the detected PA manufacturers are corresponding to the actual chips on the board.
6. To end the procedure, click Close.

Temperature sensor calibration

Context

There is a temperature sensor integrated into VINKU ASIC. VINKU provides DC-voltage, which is temperature dependent.

Temperature sensor calibration is done in room temperature, in which offset caused by VINKU variation and AD-converter inside RETU are nullified.

The module is able to do this calibration by itself, no external equipment is needed.

The temperature of the module and components must be 23 +/-2 degrees.

Steps

1. From the dropdown menus, set "Operating mode" to Local.
2. From the Product menu, choose "System mode" and then choose WCDMA, GSM or Dual and click Write.
3. From the Tuning menu, choose WCDMA -> Temperature Sensor Calibration.

4. Click Tune.

Table 13 Temperature sensor calibration tuning limits

Min	Typ	Max	Unit
-20	-4	20	⁰C

A popup window appears asking: “Save Values to PM”. Click “Yes”

5. To finish the calibration, click Close.

GSM receiver tunings

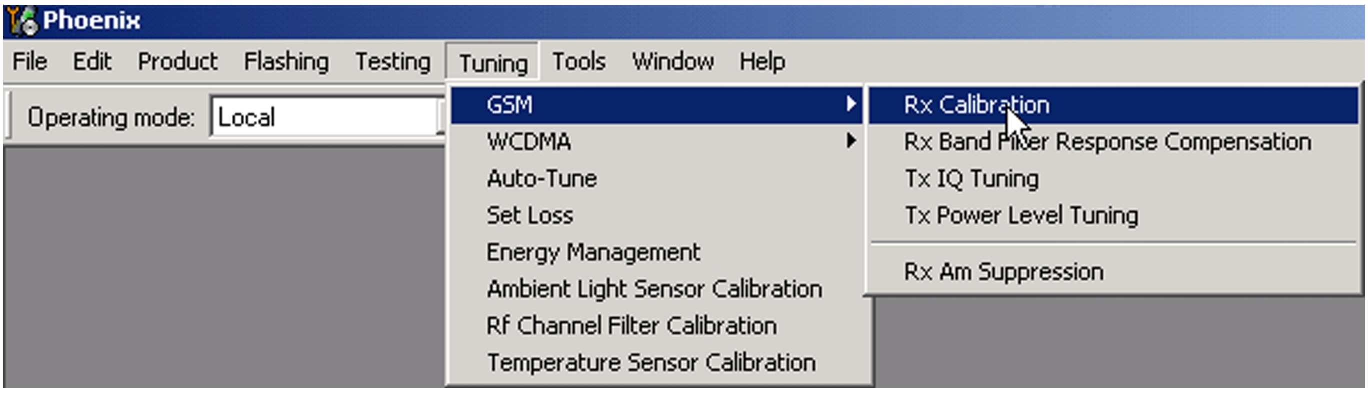
Rx calibration (GSM)

Context

Rx Calibration is used to find out the real gain values of the GSM Rx AGC system and tuning response of the AFC system (AFC D/A init value and AFC slope)

Steps

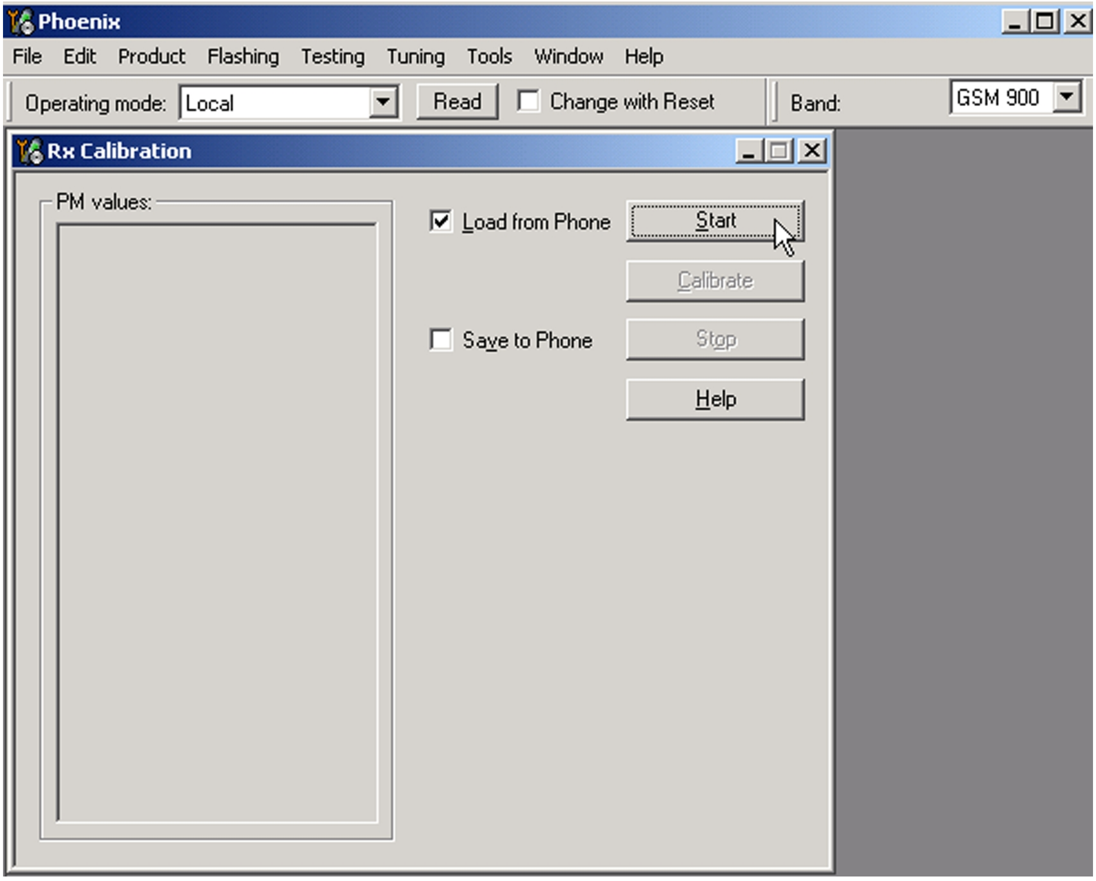
1. Connect module jig’s GSM connector to signal generator.
2. From the dropdown menus, set "Operating mode" to Local.
3. From the Product menu, choose "System mode" and then choose WCDMA, GSM or Dual and click Write.
4. From the Tuning menu, choose GSM -> Rx Calibration.


Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
Rf Channel Filter Calibration
Temperature Sensor Calibration
Rx Calibration
Rx Band Filter Response Compensation
Tx IQ Tuning
Tx Power Level Tuning
Rx Am Suppression

Operating mode: Local

5. Check the “Load from Phone” check box and clear the “Save to Phone” checkbox.
6. From the Band dropdown menu, choose GSM900.

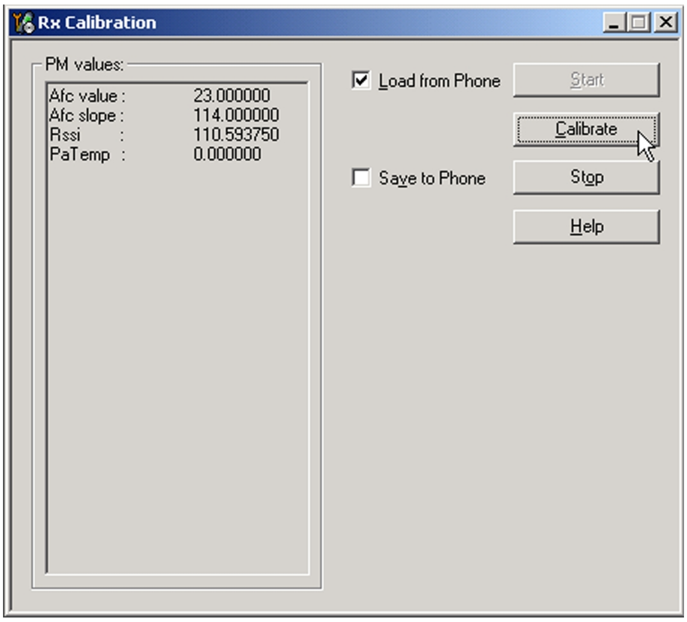
7. Click Start (if it not active already).



Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
Read
Rx Calibration
Start
Calibrate
Stop
Help

Operating mode: Local
☐ Change with Reset
Band: GSM 900
PM values:
☑ Load from Phone
☐ Save to Phone

8. Click Calibrate.



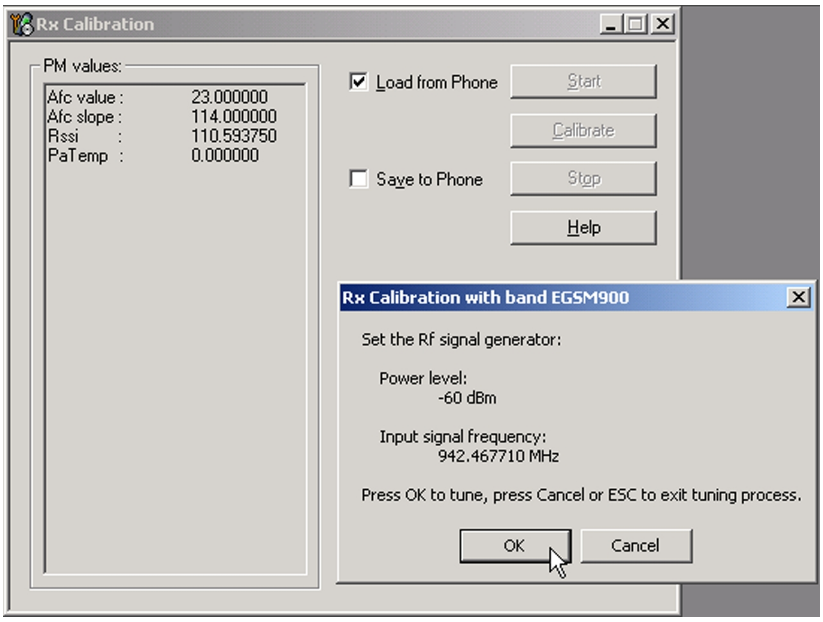
Rx Calibration
Start
Calibrate
Stop
Help

PM values:
Afc value : 23.000000
Afc slope : 114.000000
Rssi : 110.593750
PaTemp : 0.000000

☑ Load from Phone
☐ Save to Phone

9. Connect signal generator to the phone and set frequency and amplitude as instructed in the "Rx Calibration with band EGSM900" popup window.

The calibration uses a non-modulated CW signal. Increase the signal generator level by cable attenuation and module jig probe attenuation!


Rx Calibration
☑ Load from Phone
☐ Save to Phone
Start
Calibrate
Stop
Help
OK
Cancel

PM values:
Afc value : 23.000000
Afc slope : 114.000000
Rssi : 110.593750
PaTemp : 0.000000

Rx Calibration with band EGSM900

Set the Rf signal generator:

Power level:
-60 dBm

Input signal frequency:
942.467710 MHz

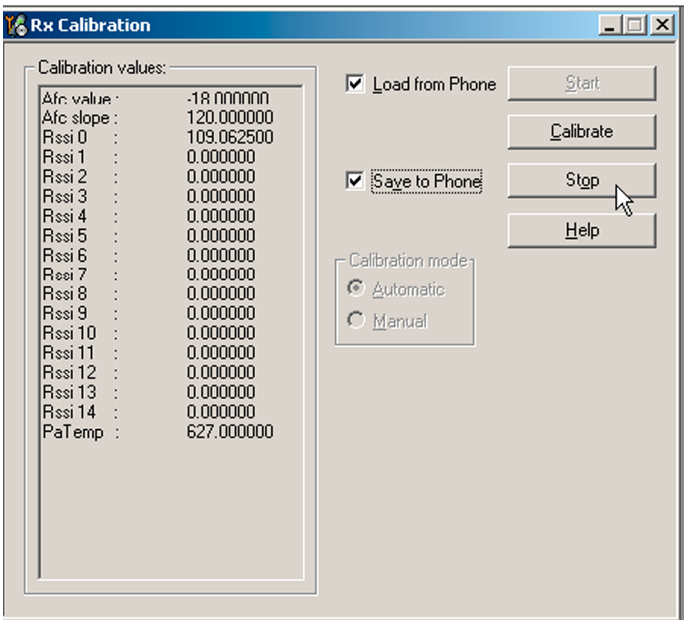
Press OK to tune, press Cancel or ESC to exit tuning process.

10. To perform tuning, click OK.
11. Check that the tuning values are within the limits specified in this table:

Table 14 RF tuning limits in Rx calibration

	Min	Typ	Max	Unit
GSM900				
AFC Value	-200	-105 62	200	
AFC slope	0	122	200	
RSSI0	106	107 110	114	dB
GSM1800				
RSSI0	104	104 109	114	dB
GSM1900				
RSSI0	104	104 109	114	dB

12. To save values to the phone, check the "Save to Phone" check box and click Stop.



Calibration values:

```
Afc value :      -18.000000
Afc slope :      120.000000
Rssi 0    :      109.062500
Rssi 1    :      0.000000
Rssi 2    :      0.000000
Rssi 3    :      0.000000
Rssi 4    :      0.000000
Rssi 5    :      0.000000
Rssi 6    :      0.000000
Rssi 7    :      0.000000
Rssi 8    :      0.000000
Rssi 9    :      0.000000
Rssi 10   :      0.000000
Rssi 11   :      0.000000
Rssi 12   :      0.000000
Rssi 13   :      0.000000
Rssi 14   :      0.000000
PaTemp    :      627.000000
```

☑ Load from Phone

☑ Save to Phone

Calibration mode

● Automatic

○ Manual

Next action

Repeat steps 3 to 8 for GSM1800 and GSM1900

Rx band filter response compensation (GSM)

Before you begin

Rx calibration must be done before the Rx Band Filter Response Compensation

Context

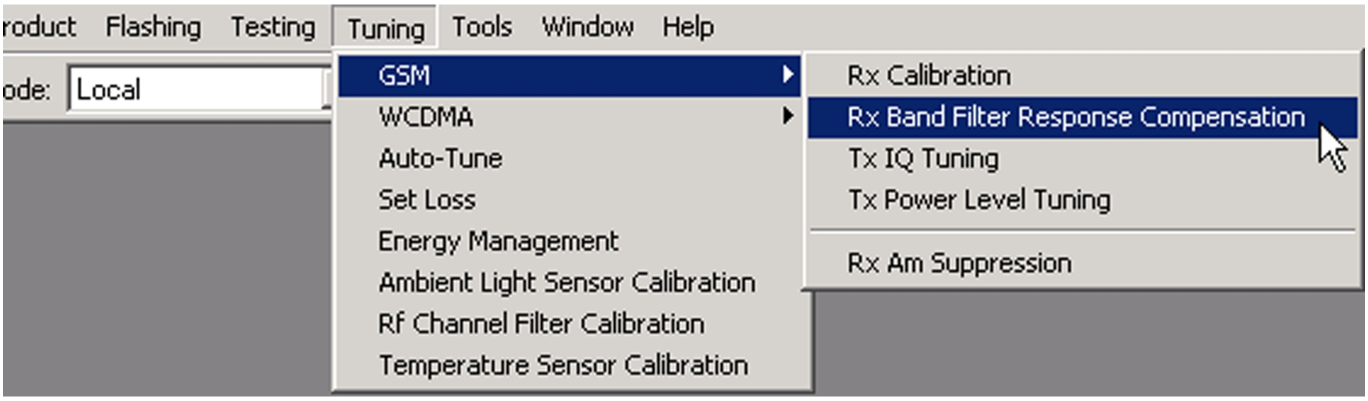
In each GSM Rx band, there’s a band rejecting filter in front of HINKU front end. The amplitude ripple caused by these filters causes ripple to the RSSI measurement and therefore calibration is needed.

The calibration has to be repeated for each GSM band.

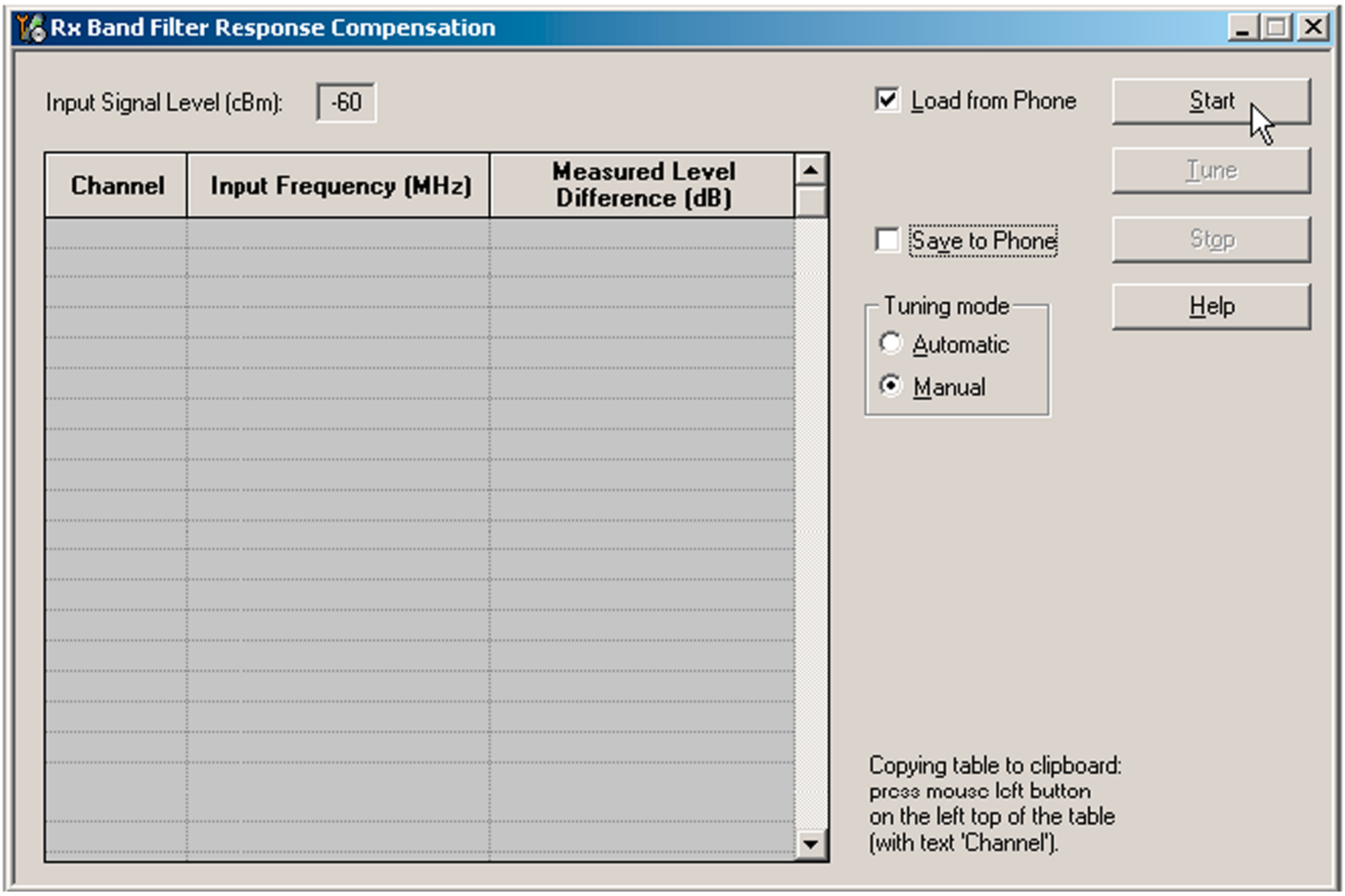
Steps

1. Connect module jig’s GSM connector to signal generator.
2. From the dropdown menus, set "Operating mode" to Local.
3. From the Product menu, choose "System mode" and then choose WCDMA, GSM or Dual and click Write.

4. From the Tuning menu, choose GSM -> Rx Band Filter Response Compensation.


roduct
Flashing
Testing
Tuning
Tools
Window
Help
ode: Local
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
Rf Channel Filter Calibration
Temperature Sensor Calibration
Rx Calibration
Rx Band Filter Response Compensation
Tx IQ Tuning
Tx Power Level Tuning
Rx Am Suppression

5. Check “Manual” and “Load from Phone” check boxes. Clear “Save to Phone” check box
6. Click Start.


Rx Band Filter Response Compensation
Start
Tune
Stop
Help
Tuning mode

Input Signal Level (cBm): -60

☑ Load from Phone

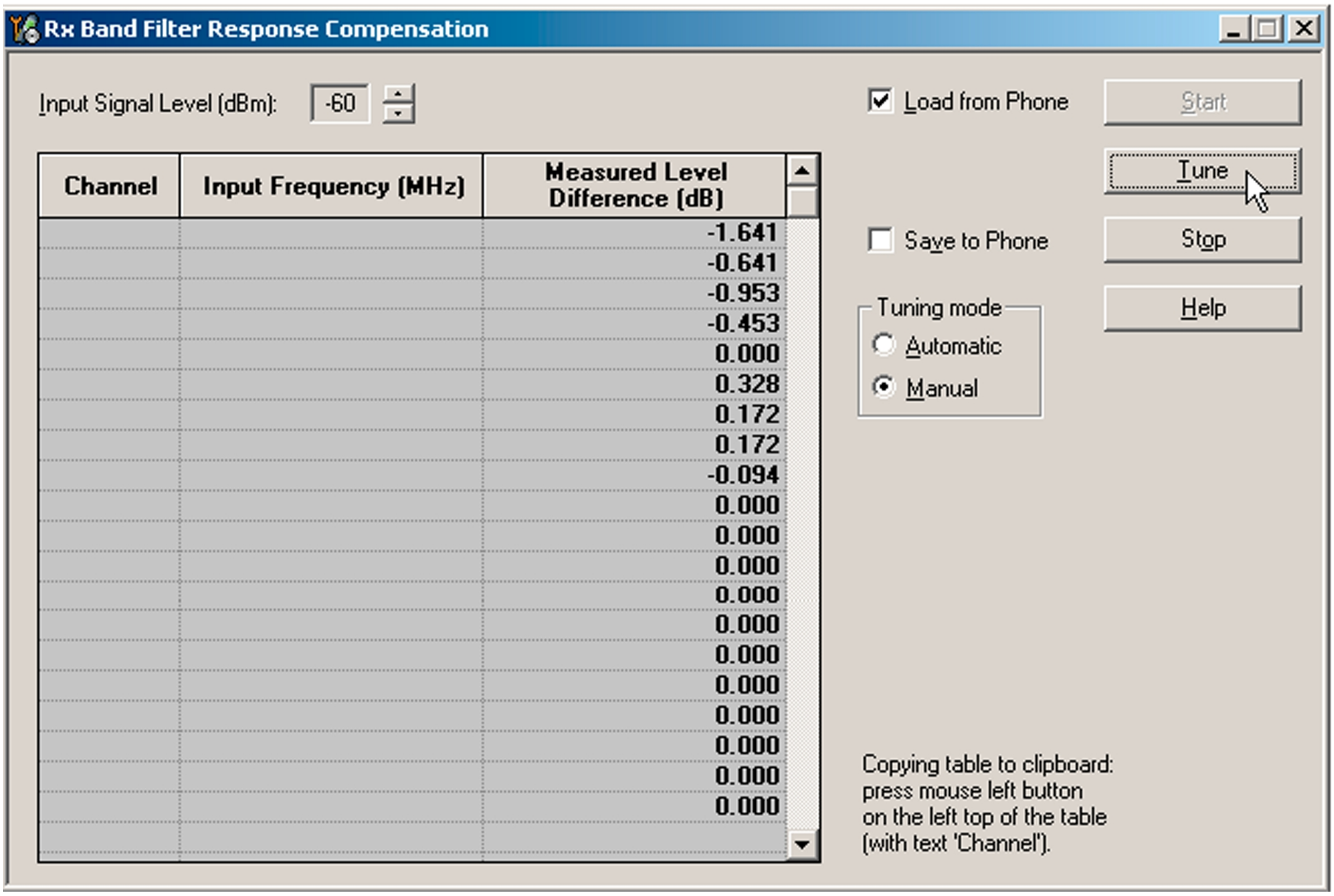
☐ Save to Phone

○ Automatic
● Manual

Channel	Input Frequency (MHz)	Measured Level Difference (dB)

Copying table to clipboard:
press mouse left button
on the left top of the table
(with text 'Channel').

7. Click Tune.



Rx Band Filter Response Compensation

Input Signal Level (dBm): -60

Channel	Input Frequency (MHz)	Measured Level Difference (dB)
		-1.641
		-0.641
		-0.953
		-0.453
		0.000
		0.328
		0.172
		0.172
		-0.094
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000

☑ Load from Phone

☐ Save to Phone

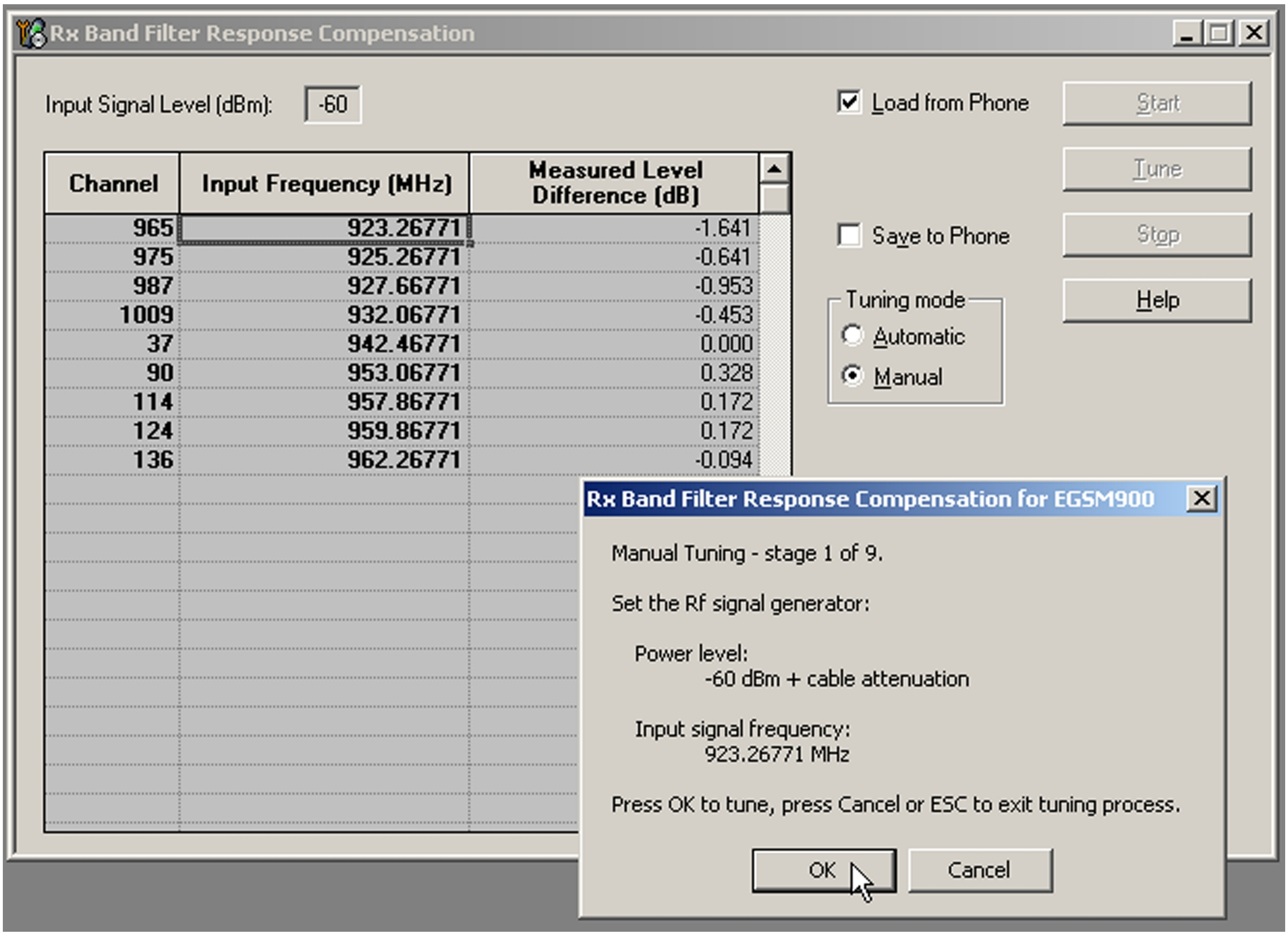
Tuning mode

○ Automatic

● Manual

Copying table to clipboard: press mouse left button on the left top of the table (with text 'Channel').

8. Connect signal generator to the phone and set frequency and amplitude as instructed in the "Rx Band Filter Response Compensation for EGSM900" popup window.



Input Signal Level (dBm): -60

☑ Load from Phone

☐ Save to Phone

Tuning mode: ○ Automatic ● Manual

Channel	Input Frequency (MHz)	Measured Level Difference (dB)
965	923.26771	-1.641
975	925.26771	-0.641
987	927.66771	-0.953
1009	932.06771	-0.453
37	942.46771	0.000
90	953.06771	0.328
114	957.86771	0.172
124	959.86771	0.172
136	962.26771	-0.094

Rx Band Filter Response Compensation for EGSM900

Manual Tuning - stage 1 of 9.

Set the Rf signal generator:

Power level:
-60 dBm + cable attenuation

Input signal frequency:
923.26771 MHz

Press OK to tune, press Cancel or ESC to exit tuning process.

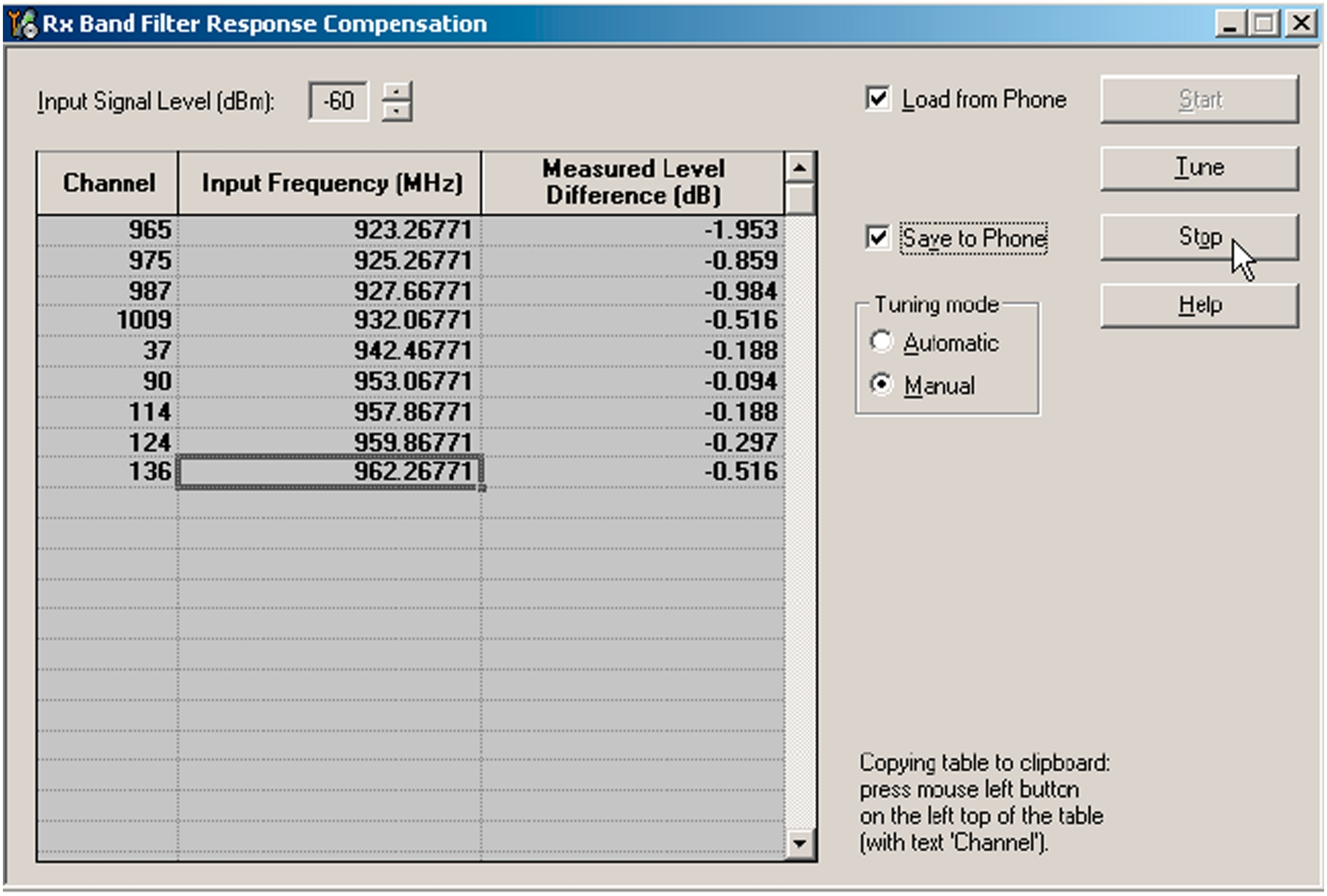
9. To perform tuning, click OK.
10. Go through all 9 frequencies.
11. Check that the tuning values are within the limits specified in this table:

	Min	Typ	Max	Unit
GSM900				
Ch. 965 / 923.26771 MHz	-10	-1	5	dB
Ch. 975 / 925.26771 MHz	-3	0	5	dB
Ch. 987 / 927.66771 MHz	-3	0	5	dB
Ch. 1009 / 932.06771 MHz	-3	0	5	dB
Ch. 37 / 942.46771 MHz	-3	0	5	dB

	Min	Typ	Max	Unit
Ch. 90 / 953.06771 MHz	-3	0	5	dB
Ch. 114 / 957.86771 MHz	-3	0	5	dB
Ch. 124 / 959.86771 MHz	-3	0	5	dB
Ch. 136 / 962.26771 MHz	-10	-1	5	dB
GSM1800				
Ch. 497 / 1802.26771 MHz	-10	-1	5	dB
Ch. 512 / 1805.26771 MHz	-3	0	5	dB
Ch. 535 / 1809.86771 MHz	-3	0	5	dB
Ch. 606 / 1824.06771 MHz	-3	0	5	dB
Ch. 700 / 1842.86771 MHz	-3	0	5	dB
Ch. 791 / 1861.06771 MHz	-3	0	5	dB
Ch. 870 / 1876.86771 MHz	-3	0	5	dB
Ch. 885 / 1879.86771 MHz	-3	0	5	dB
Ch. 908 / 1884.46771 MHz	-10	-1	5	dB
GSM1900				
Ch. 496 / 1927.06771 MHz	-10	-1	5	dB
Ch. 512 / 1930.26771 MHz	-3	0	5	dB
Ch. 537 / 1935.26771 MHz	-3	0	5	dB
Ch. 586 / 1945.06771 MHz	-3	0	5	dB
Ch. 661 / 1960.06771 MHz	-3	0	5	dB
Ch. 736 / 1975.06771 MHz	-3	0	5	dB

	Min	Typ	Max	Unit
Ch. 794 / 1986.66771 MHz	-3	0	5	dB
Ch. 810 / 1989.86771 MHz	-3	0	5	dB
Ch. 835 / 1994.86771 MHz	-10	-1	5	dB

12. Check the "Save to Phone" check box and click Stop if the values are within the limits.



Input Signal Level (dBm): -60

☑ Load from Phone

☑ Save to Phone

Tuning mode
○ Automatic
● Manual

Channel	Input Frequency (MHz)	Measured Level Difference (dB)
965	923.26771	-1.953
975	925.26771	-0.859
987	927.66771	-0.984
1009	932.06771	-0.516
37	942.46771	-0.188
90	953.06771	-0.094
114	957.86771	-0.188
124	959.86771	-0.297
136	962.26771	-0.516

Copying table to clipboard: press mouse left button on the left top of the table (with text 'Channel').

Next action

Repeat the steps 4 to 10 for GSM1800 and GSM1900.

Rx AM suppression (GSM)

Context

Rx AM suppression is used to tune the AM suppression capabilities of the GSM receiver.

AM suppression is related to ability of the receiver to operate when there is disturbing AM modulated signal near the received channel signal frequency.

RFIC has tunable compensation circuit which has an effect on the AM suppression ability.

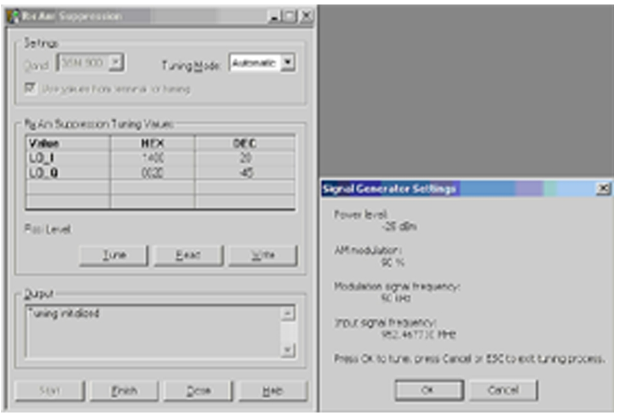
In the tuning, a continuous useful signal + AM modulated signal 10MHz above current channel is fed to the antenna. RFIC control word values are iterated until a minimum RSSI signal is found.

Steps

1. Connect module jig's GSM connector to signal generator.
2. From the dropdown menus, set "Operating mode" to Local.
3. From the Product menu, choose "System mode" and then choose WCDMA, GSM or Dual and click Write.
4. From the Tuning menu, choose GSM -> Rx AM Suppression.
5. From the droptown menus, set "Band" to GSM 900 and set "Tuning Mode" to Automatic.
6. Connect signal generator to phone according to the frequency and modulation parameters displayed in the tuning window:

Frequency	952.46771MHz / 1852.86771MHz / 1970.06771 MHz (depending on the band used)
Power level	-25 dBm / -26 dBm / -29 dBm (increase by cable and jig attenuations)
Modulation	AM
AM modulation depth	90%
Modulation signal	50 kHz sinewave (or 15 kHz if 50 kHz is not available)

7. Click Start.


Signal Generator Settings

Power level
-25 dBm

AM modulation:
90 %

Modulation signal frequency:
50 kHz

Input signal frequency:
952.46771 MHz

Press OK to tune, press Cancel or ESC to exit tuning process.

Tuning initialized

8. Click Tune.
9. Check that RSSI level value is between the limits presented in this table. If not, try clicking the Tune button again.

Table 15 RSSI level values

Band	Min	Max	Unit
GSM900	-115	-90	dB
GSM1800	-115	-85	dB
GSM1900	-115	-100	dB

10. Make sure that the "Save to Phone" check box is checked and click Stop.

Next action

Repeat steps 3 to 7 for GSM1800 and GSM1900.

GSM transmitter tunings

Tx IQ tuning (GSM)

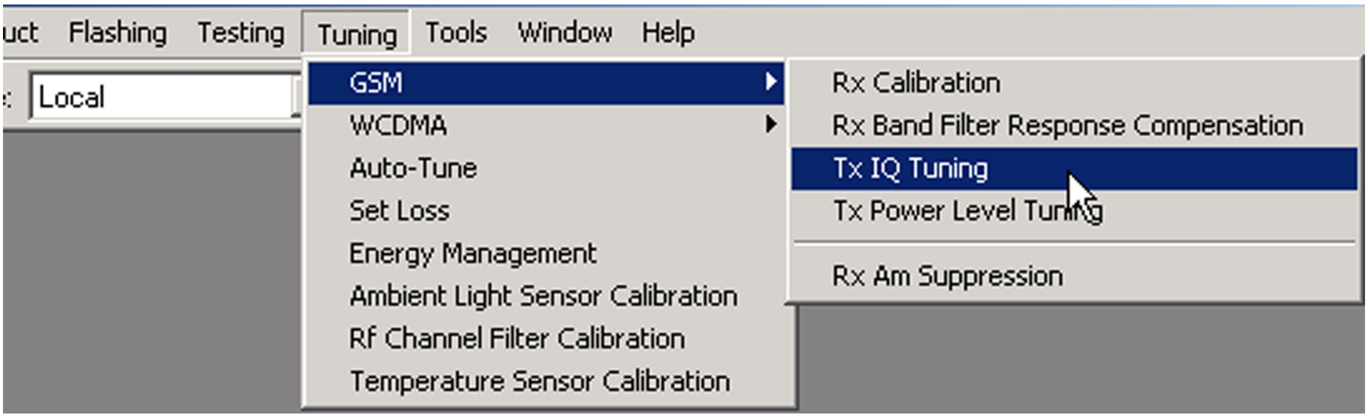
Context

The Tx path branches to I and Q signals at RF I/Q modulator. Modulator and analog hardware located after it cause unequal amplitude and phase disturbance to I and Q signal paths. Tx IQ tuning tuning balances the I and Q branches.

Tx IQ tuning must be performed on all GSM bands. GSM1900 uses the same values as GSM1800.

Steps

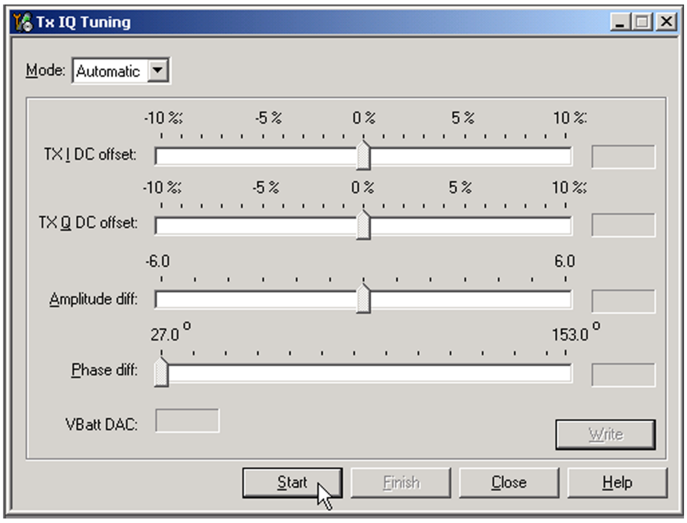
1. From the dropdown menus, set "Operating mode" to Local, "System mode" to GSM, and Band to GSM900.
2. From the Tuning menu, choose GSM -> Tx IQ Tuning.


uct
Flashing
Testing
Tuning
Tools
Window
Help
Local
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
RF Channel Filter Calibration
Temperature Sensor Calibration
Rx Calibration
Rx Band Filter Response Compensation
Tx IQ Tuning
Tx Power Level Tuning
Rx Am Suppression

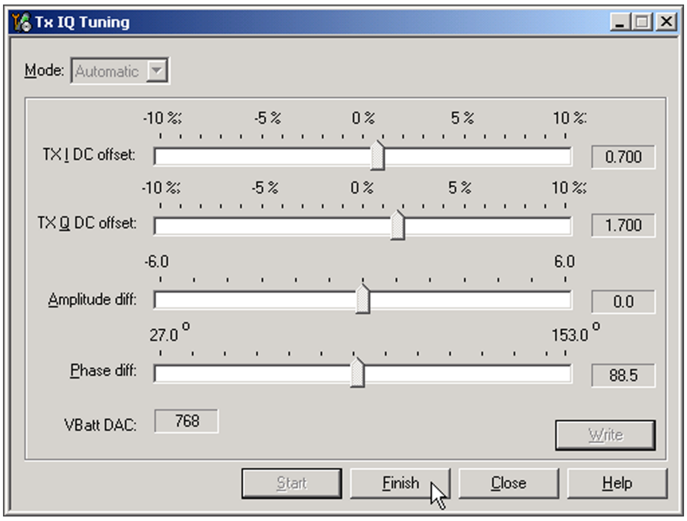
3. Set Mode to Automatic and Edge to Off.
4. Click Start.

   Wait until automatic tuning has finished and moved the sliders.

   Values are written to the phone memory automatically.


Mode: Automatic
Tx IQ Tuning
-10 %
-5 %
0 %
5 %
10 %
TX I DC offset:
-10 %
-5 %
0 %
5 %
10 %
TX Q DC offset:
-6.0
6.0
Amplitude diff:
27.0 °
153.0 °
Phase diff:
VBatt DAC:
Write
Start
Finish
Close
Help

5. When the values have been written to the phone memory, click the Finish button to end the tuning.



Mode: Automatic
TX I DC offset: 0.700
TX Q DC offset: 1.700
Amplitude diff: 0.0
Phase diff: 88.5
VBatt DAC: 768

6. Change band to GSM1800 and repeat steps 4 to 5.
7. Change band to GSM1900 and repeat steps 4 to 5.
8. To close the tuning window, click Close.

Next action

Tuning sliders should be close to the center of the scale after the tuning and within the limits specified in the table below. If they are not within the limits, check Tx IQ quality manually.

	Min	Typ	Max	Unit
GSM900				
I DC offset / Q DC offset	-6	-4...+4	6	dB
Ampl	-1	0	1	dB
Phase	85	90	95	dB
GSM1800/GSM1900				
I/Q DC	-6	-0.5...+0.5	6	dB
Ampl	-1	0	1	dB
Phase	95	100	110	dB

Tx power level tuning (GSM)

Context

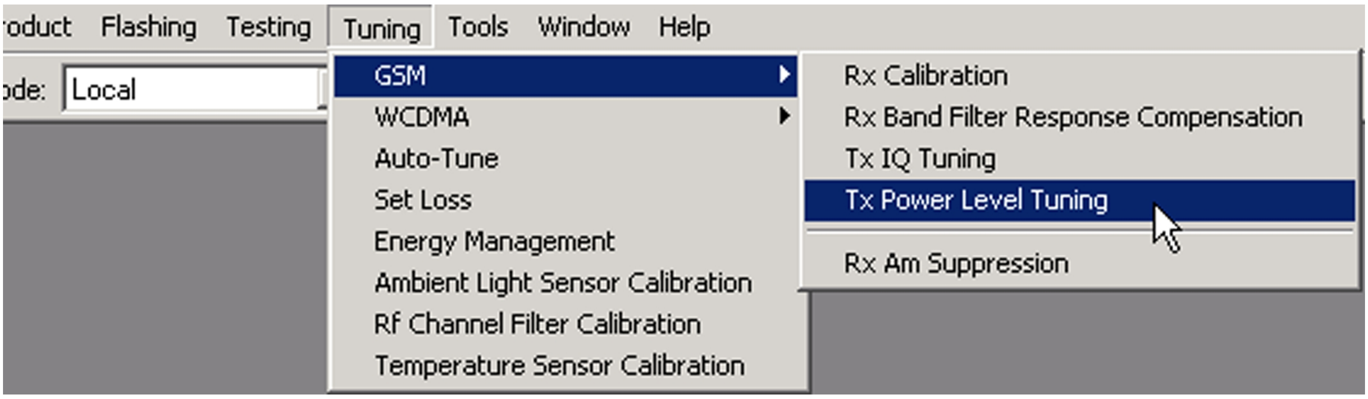
Because of variations at IC process and discrete component values, actual transmitter RF gain of each phone is different. Tx power level tuning is used to find out mapping factors called 'power coefficients'. These adjust the GSM transmitter output power to fulfill the specifications.

For EDGE transmission the bias settings of the GSM PA are adjusted in order to improve linearity. This affects the PA gain and hence the power levels have to be aligned separately for EDGE transmission.

Tx power level tuning has to be performed on all GSM bands.

Steps

1. Connect the phone to a spectrum analyzer.
2. From the dropdown menus, set "Operating mode" to Local, "System mode" to GSM, and Band to GSM900.
3. From the Tuning menu, choose GSM -> Tx Power Level Tuning.

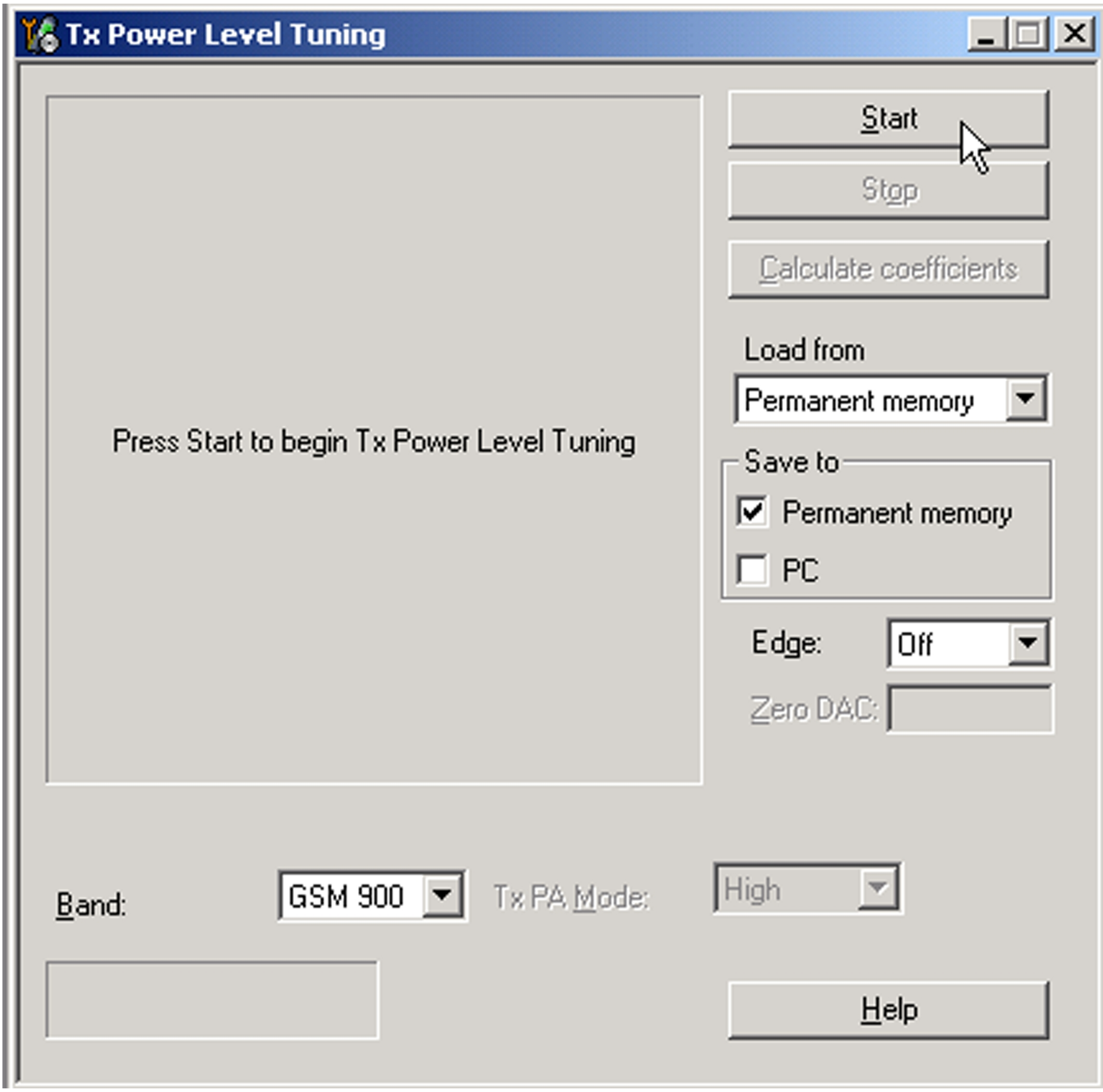

roduct
Flashing
Testing
Tuning
Tools
Window
Help
ode:
Local
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
Rf Channel Filter Calibration
Temperature Sensor Calibration
Rx Calibration
Rx Band Filter Response Compensation
Tx IQ Tuning
Tx Power Level Tuning
Rx Am Suppression

4. Set Mode to Automatic and Edge to Off.
5. Set the spectrum analyzer for power level tuning:

Frequency	channel frequency (897.4MHz GSM900, 1747.8MHz GSM1800, 1880MHz GSM1900)
Span	0 Hz
Sweep time	2ms
Trigger	Video triggering (-10dBm)
Resolution BW	3MHz
Video BW	3MHz
Reference level offset	sum cable attenuation with module jig attenuation
Reference level	33dBm

A power meter with a peak power detector can be also used. Remember to take the attenuations in the account!

6. Click Start.


Tx Power Level Tuning
Start
Stop
Calculate coefficients
Load from
Save to
PC
Edge:
Zero DAC:
Band:
Tx PA Mode:
High
Help

Press Start to begin Tx Power Level Tuning

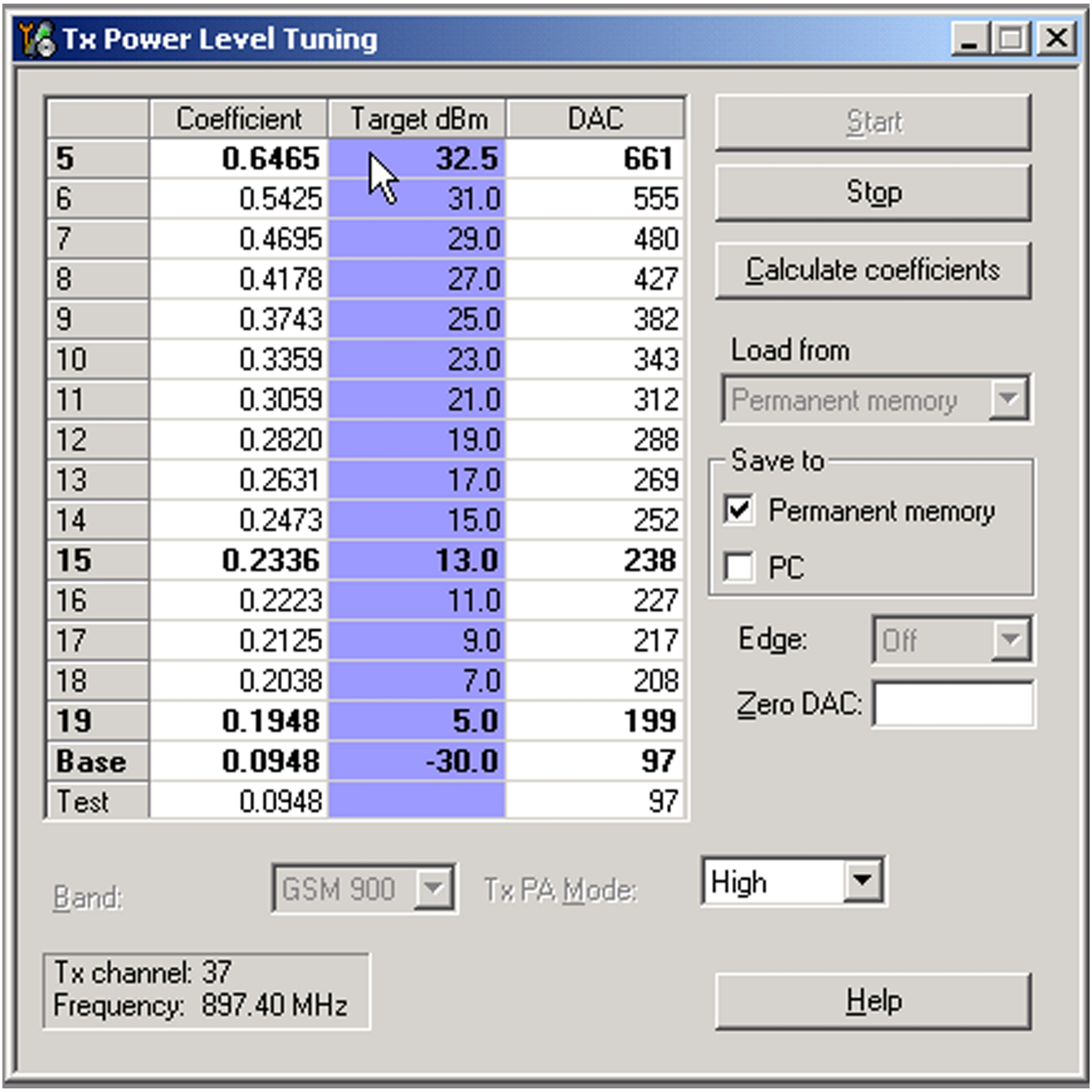
Load from: Permanent memory

Save to:
☑ Permanent memory
☐ PC

Edge: Off

Band: GSM 900

7. Adjust power levels 5, 15 and 19 to correspond the "Target dBm" column by pressing + or – keys.



	Coefficient	Target dBm	DAC
5	**0.6465**	**32.5**	**661**
6	0.5425	31.0	555
7	0.4695	29.0	480
8	0.4178	27.0	427
9	0.3743	25.0	382
10	0.3359	23.0	343
11	0.3059	21.0	312
12	0.2820	19.0	288
13	0.2631	17.0	269
14	0.2473	15.0	252
15	**0.2336**	**13.0**	**238**
16	0.2223	11.0	227
17	0.2125	9.0	217
18	0.2038	7.0	208
19	**0.1948**	**5.0**	**199**
Base	**0.0948**	**-30.0**	**97**
Test	0.0948		97

Load from: Permanent memory

Save to
☑ Permanent memory
☐ PC

Edge: Off

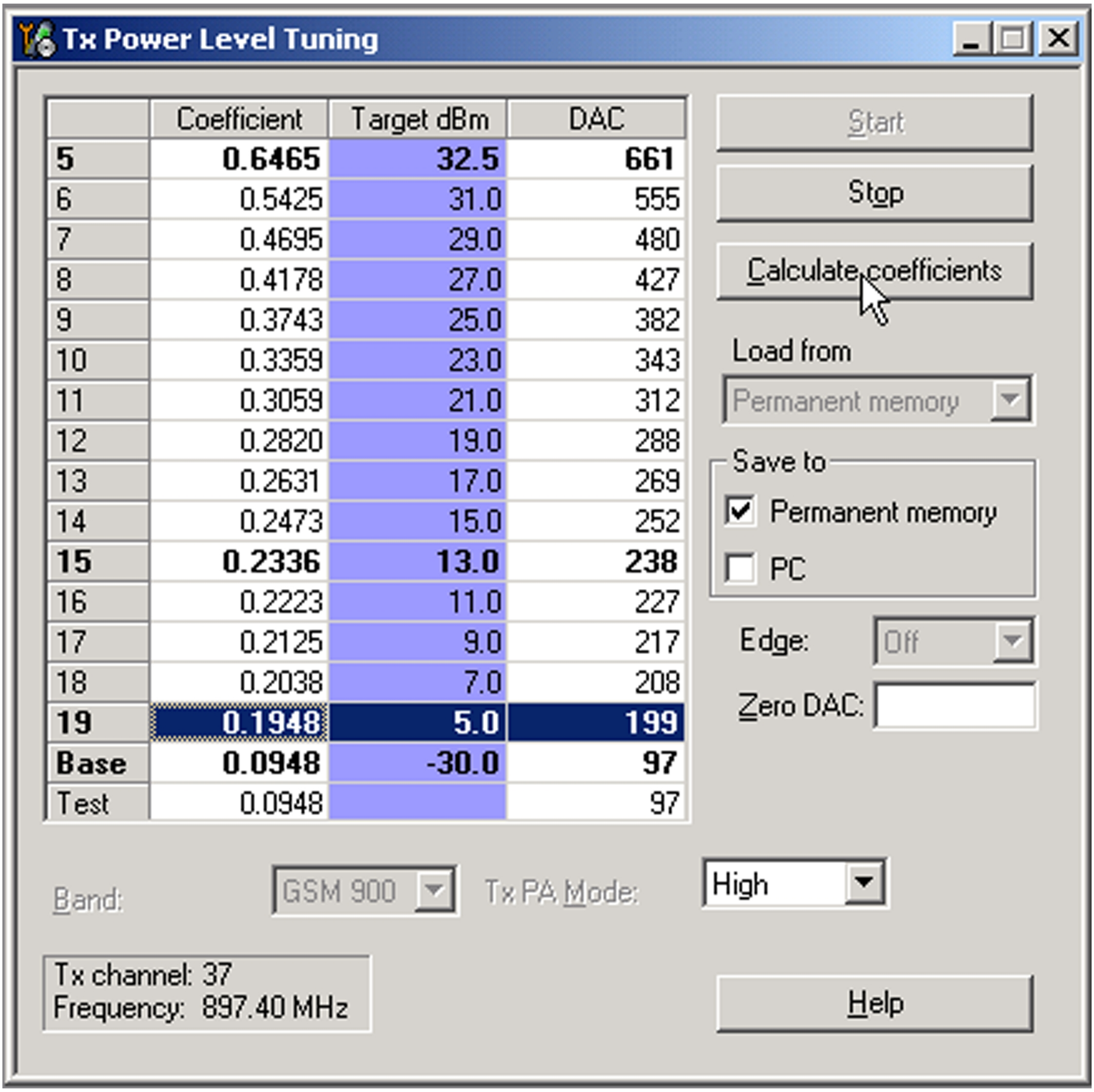
Zero DAC:

Band: GSM 900

Tx PA Mode: High

Tx channel: 37
Frequency: 897.40 MHz

8. Click Calculate Coefficients.



	Coefficient	Target dBm	DAC
5	**0.6465**	**32.5**	**661**
6	0.5425	31.0	555
7	0.4695	29.0	480
8	0.4178	27.0	427
9	0.3743	25.0	382
10	0.3359	23.0	343
11	0.3059	21.0	312
12	0.2820	19.0	288
13	0.2631	17.0	269
14	0.2473	15.0	252
15	**0.2336**	**13.0**	**238**
16	0.2223	11.0	227
17	0.2125	9.0	217
18	0.2038	7.0	208
19	**0.1948**	**5.0**	**199**
Base	**0.0948**	**-30.0**	**97**
Test	0.0948		97

Load from: Permanent memory

Save to:
☑ Permanent memory
☐ PC

Edge: Off

Zero DAC:

Band: GSM 900

Tx PA Mode: High

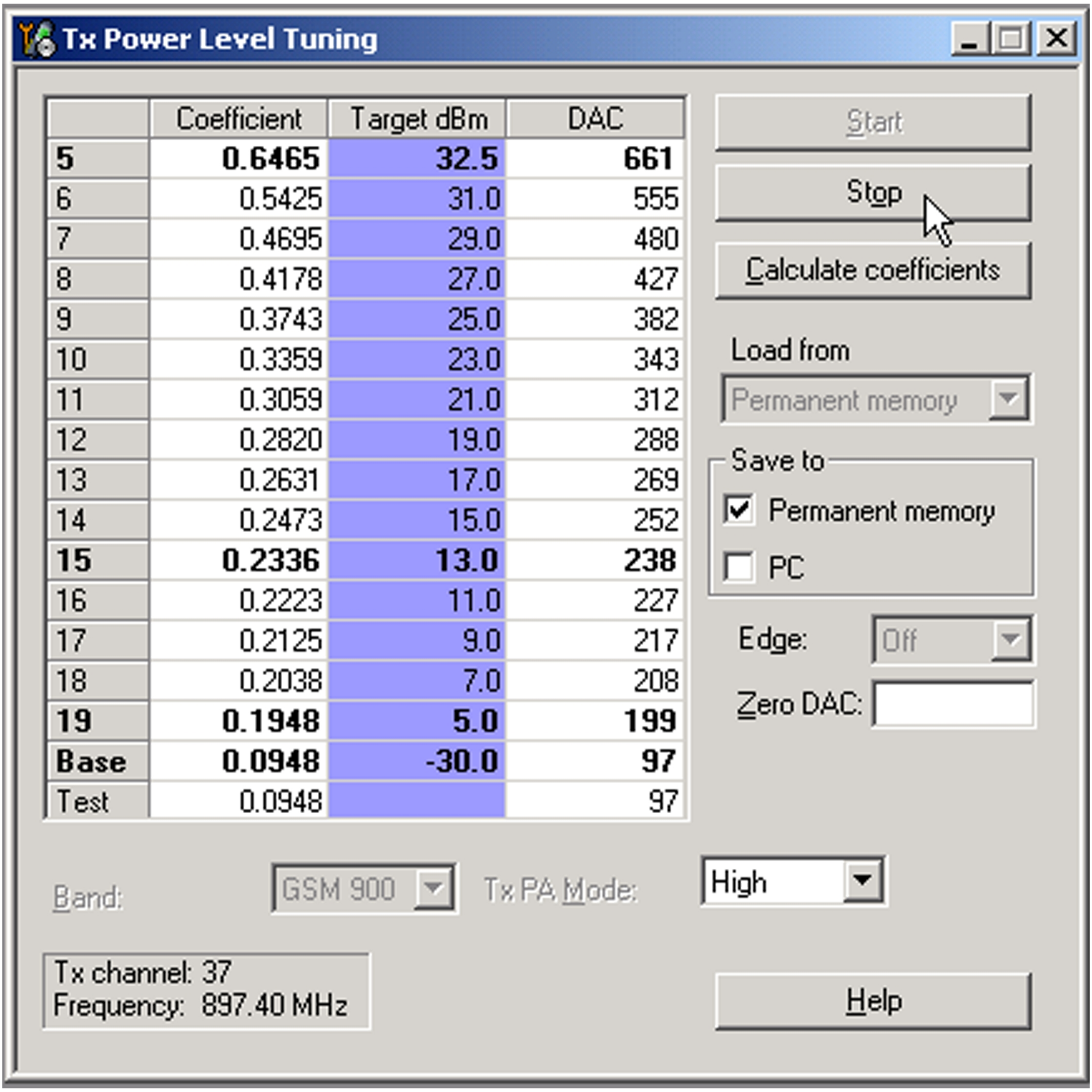
Tx channel: 37
Frequency: 897.40 MHz

9. Check that the coeffiecient values are within the limits specified in the following table.

	Min	Typ	Max
GSM900 EDGE off			
PL5 coefficient	0.380	0.460	0.73
PL15 coefficient		0.234	
PL19 coefficient	0.12	0.195	0.3
GSM900 EDGE on			

	Min	Typ	Max
PL8 coefficient	0.330	0.380	0.6
PL15 coefficient		0.247	
PL19 coefficient	0.12	0.204	0.3
GSM1800 EDGE off			
PL0 coefficient	0.380	0.450	0.7
PL11 coefficient		0.219	
PL15 coefficient	0.12	0.185	0.3
GSM1800 EDGE on			
PL2 coefficient	0.330	0.394	0.6
PL11 coefficient		0.23	
PL15 coefficient	0.12	0.194	0.3
GSM1900 EDGE off			
PL0 coefficient	0.380	0.450	0.7
PL11 coefficient		0.218	
PL15 coefficient	0.12	0.184	0.3
GSM1900 EDGE on			
PL2 coefficient	0.330	0.390	0.6
PL11 coefficient		0.23	
PL15 coefficient	0.12	0.193	0.3

If the values are within the limits, check that the "Save to Phone Permanent Memory" check box is checked and click Stop.


Tx Power Level Tuning
Start
Stop
Calculate coefficients
Help

	Coefficient	Target dBm	DAC
5	**0.6465**	**32.5**	**661**
6	0.5425	31.0	555
7	0.4695	29.0	480
8	0.4178	27.0	427
9	0.3743	25.0	382
10	0.3359	23.0	343
11	0.3059	21.0	312
12	0.2820	19.0	288
13	0.2631	17.0	269
14	0.2473	15.0	252
15	**0.2336**	**13.0**	**238**
16	0.2223	11.0	227
17	0.2125	9.0	217
18	0.2038	7.0	208
19	**0.1948**	**5.0**	**199**
Base	**0.0948**	**-30.0**	**97**
Test	0.0948		97

Load from: Permanent memory

Save to
☑ Permanent memory
☐ PC

Edge: Off

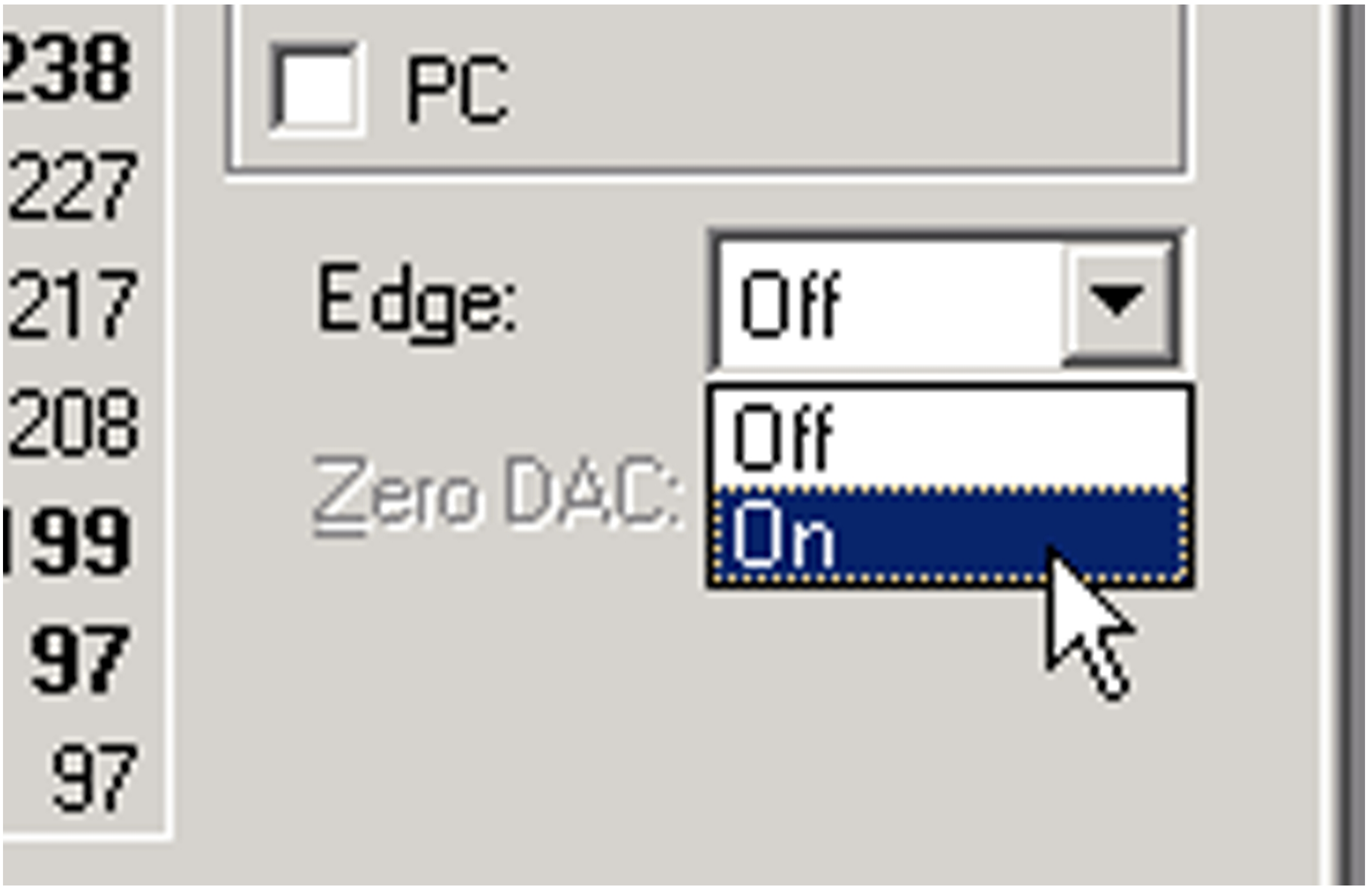
Zero DAC:

Band: GSM 900

Tx PA Mode: High

Tx channel: 37
Frequency: 897.40 MHz

10. Set **Edge** mode on and start tuning again. Change video averaging to 50.



11. Tune EDGE power levels to the corresponding target power levels.

    Only power levels **8**, **15** and **19** are tuned in GSM900 and **2**, **10** and **15** in GSM1800/1900. The rest are calculated by clicking the Calculate Coefficients button. Check the coefficients against the RF tuning limits table presented in Step 9.
12. When the tuning is completed, click Stop.

Next action

Repeat steps 4 to 9 for GSM1800 and GSM1900. On those bands only power levels **0**, **11** and **15** need to be tuned.

WCDMA receiver tunings

Rx AGC alignment (WCDMA)

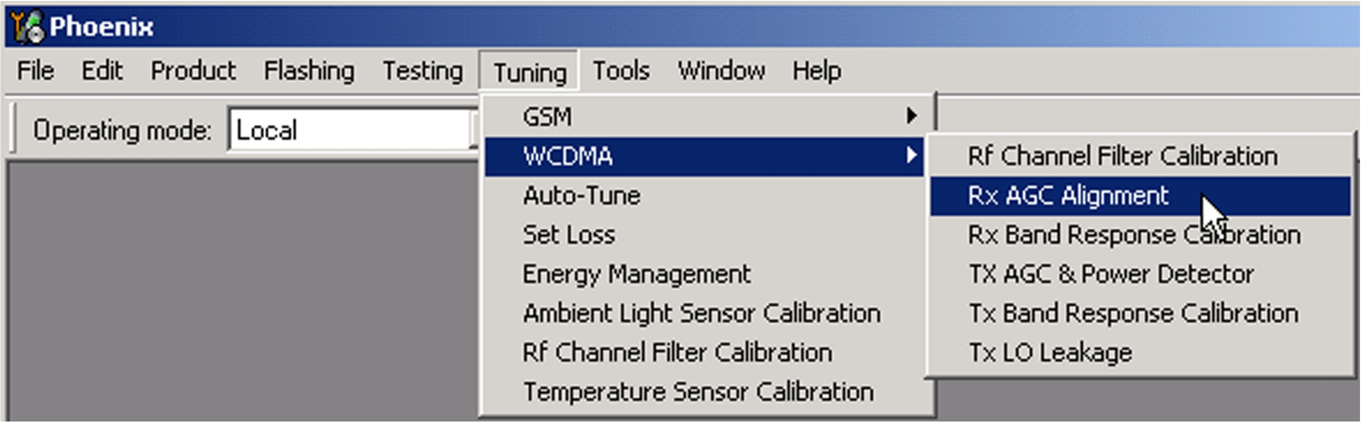
Context

Rx AGC alignment tuning is used to find out the real gain values of the WCDMA Rx AGC system and converters.

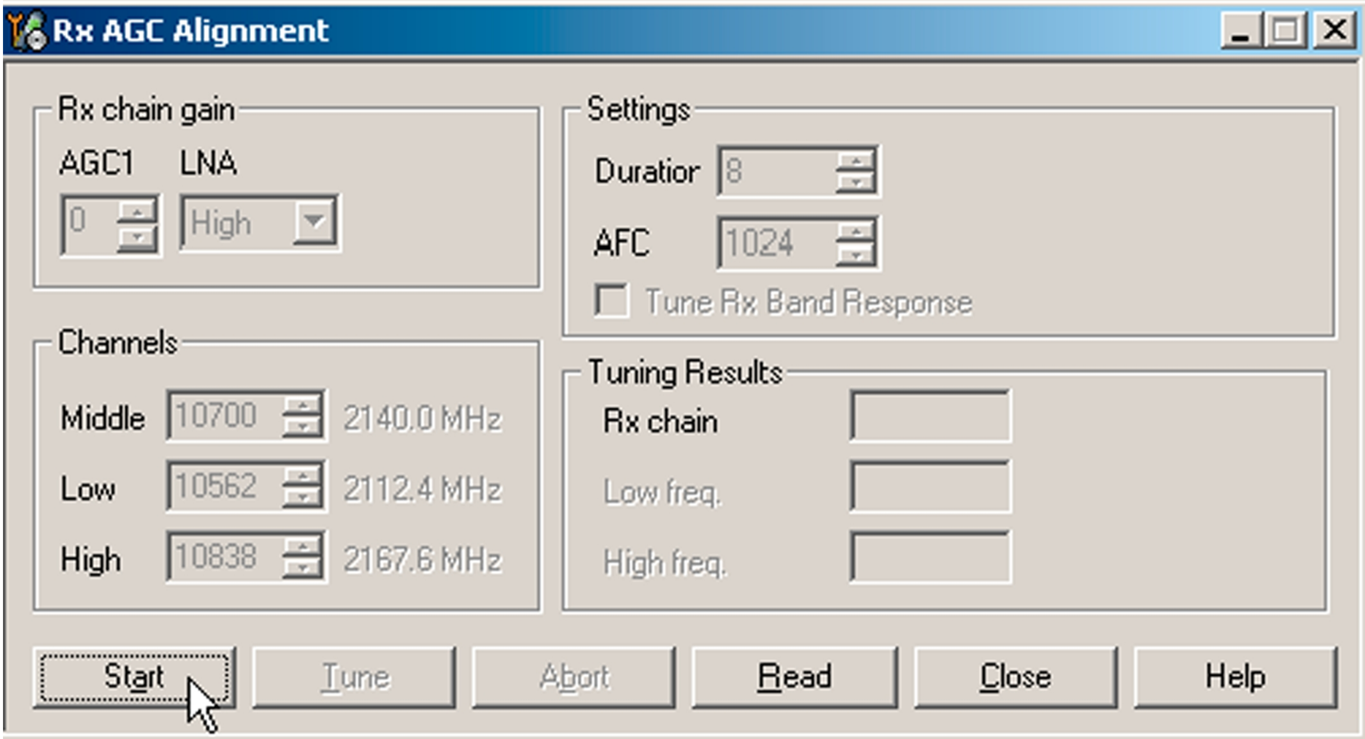
Steps

1. From the dropdown menus, set "Operating mode" to Local and "System mode" to WCDMA.

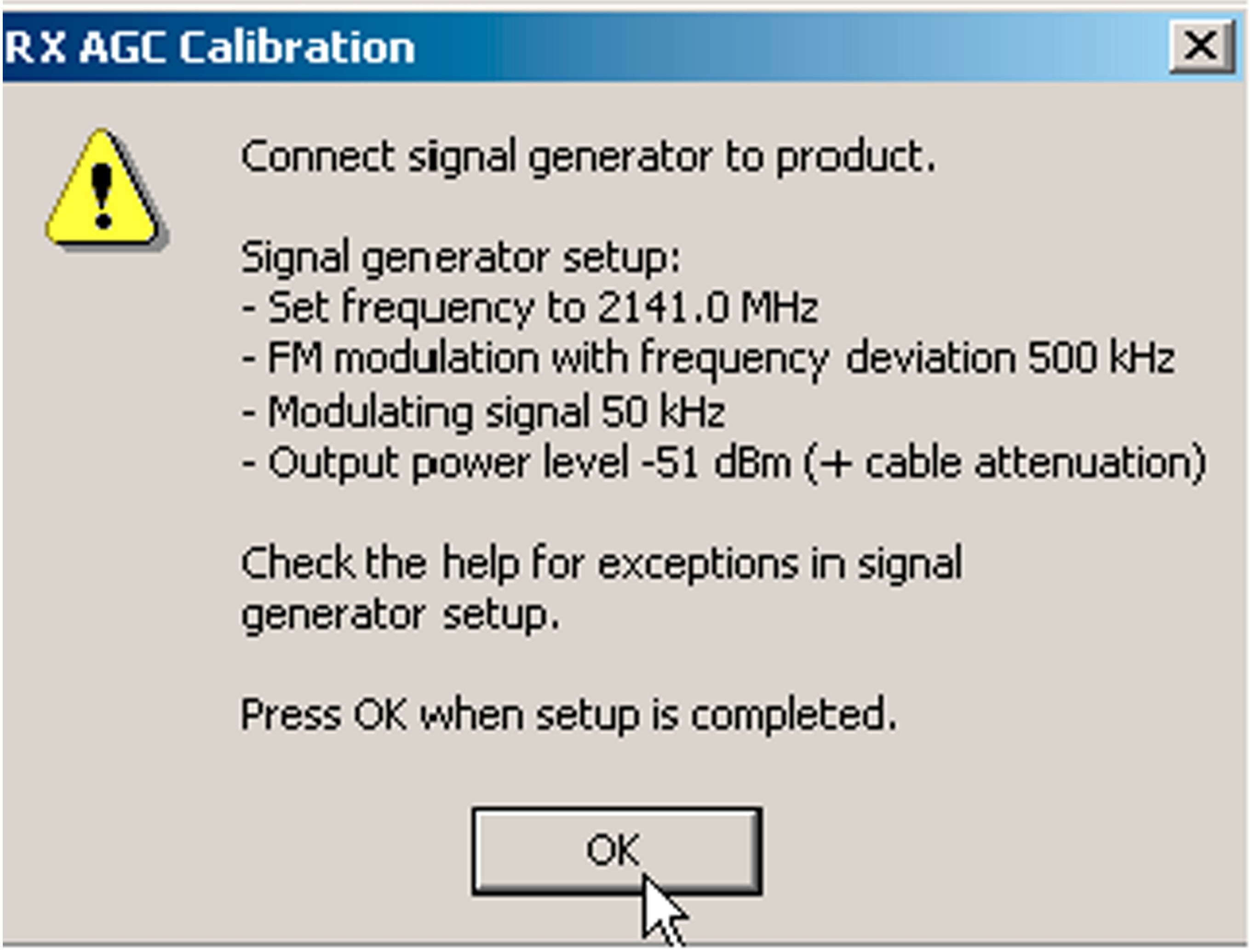
2. From the Tuning menu, choose WCDMA -> Rx AGC Alignment.


Phoenix
File Edit Product Flashing Testing Tuning Tools Window Help
Operating mode: Local
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
Rf Channel Filter Calibration
Temperature Sensor Calibration
Rf Channel Filter Calibration
Rx AGC Alignment
Rx Band Response Calibration
TX AGC & Power Detector
Tx Band Response Calibration
Tx LO Leakage

3. Click Start and Tune.


Rx AGC Alignment
Rx chain gain
AGC1
LNA
0
High
Settings
Duration
8
AFC
1024
☐ Tune Rx Band Response
Channels
Middle
10700
2140.0 MHz
Low
10562
2112.4 MHz
High
10838
2167.6 MHz
Tuning Results
Rx chain
Low freq.
High freq.
Start
Tune
Abort
Read
Close
Help

4. Setup the signal generator to correspond the values in the "RX AGC Calibration" pop-up window and click OK:



Connect signal generator to product.

Signal generator setup:
- Set frequency to 2141.0 MHz
- FM modulation with frequency deviation 500 kHz
- Modulating signal 50 kHz
- Output power level -51 dBm (+ cable attenuation)

Check the help for exceptions in signal generator setup.

Press OK when setup is completed.

Frequency:	2141MHz
Level:	–51 dBm + cable and adapter attenuations
Modulation:	FM
Deviation:	500 kHz
Modulation frequency:	50 kHz

5. Check that the “Rx Chain” value in “Tuning Results” is within the limits presented in the table below.

	Min	Typ	Max	Unit
RX chain	-6	1.5 3.5	6	dB
Low freq	-5	-0.7 4.0	5	
High freq	-5	-0.7 4.0	5	

6. If the Rx gain is acceptable, click Yes to save the results to the phone.
7. To close the tuning window, click Close.

Rx band response calibration (WCDMA)

Context

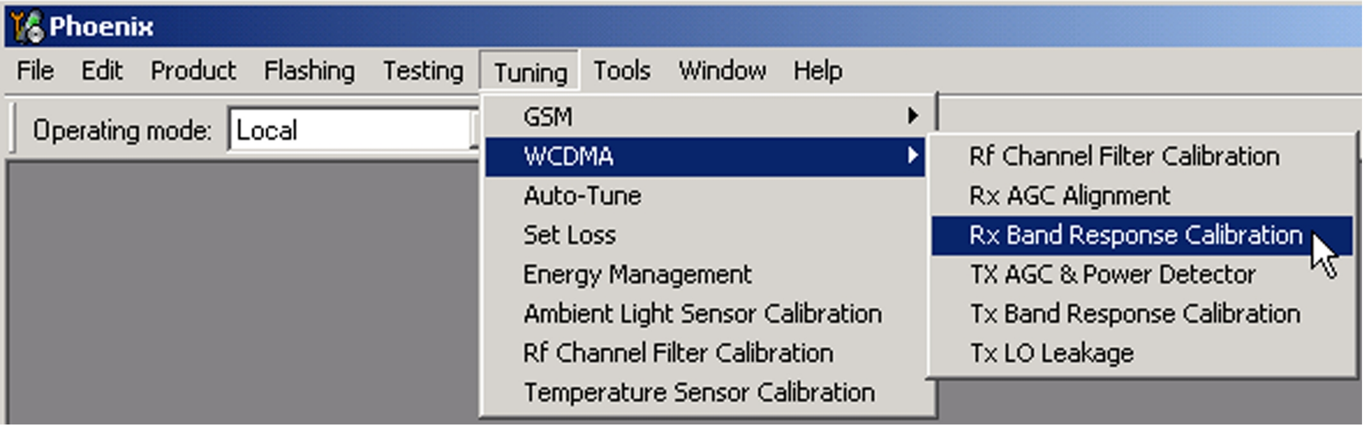
There is a band rejecting filter for each WCDMA Rx band between the front end LNA and the mixer of HINKU. The amplitude ripple caused by this filter causes ripple to the RSSI measurement and therefore Rx band response calibration is needed.

Rx band response calibration can be done in two different ways. If the signal generator in use supports frequency sweep table, the calibration can be done as a part of Rx calibration. If not, it is possible to calibrate all the necessary frequencies one by one.

The first set of steps shows how to perform the calibration without the signal generator sweep feature and the alternative steps give instructions how to perform the calibration if the signal generator supports frequency sweeps and the calibration can be performed within Rx AGC calibration.

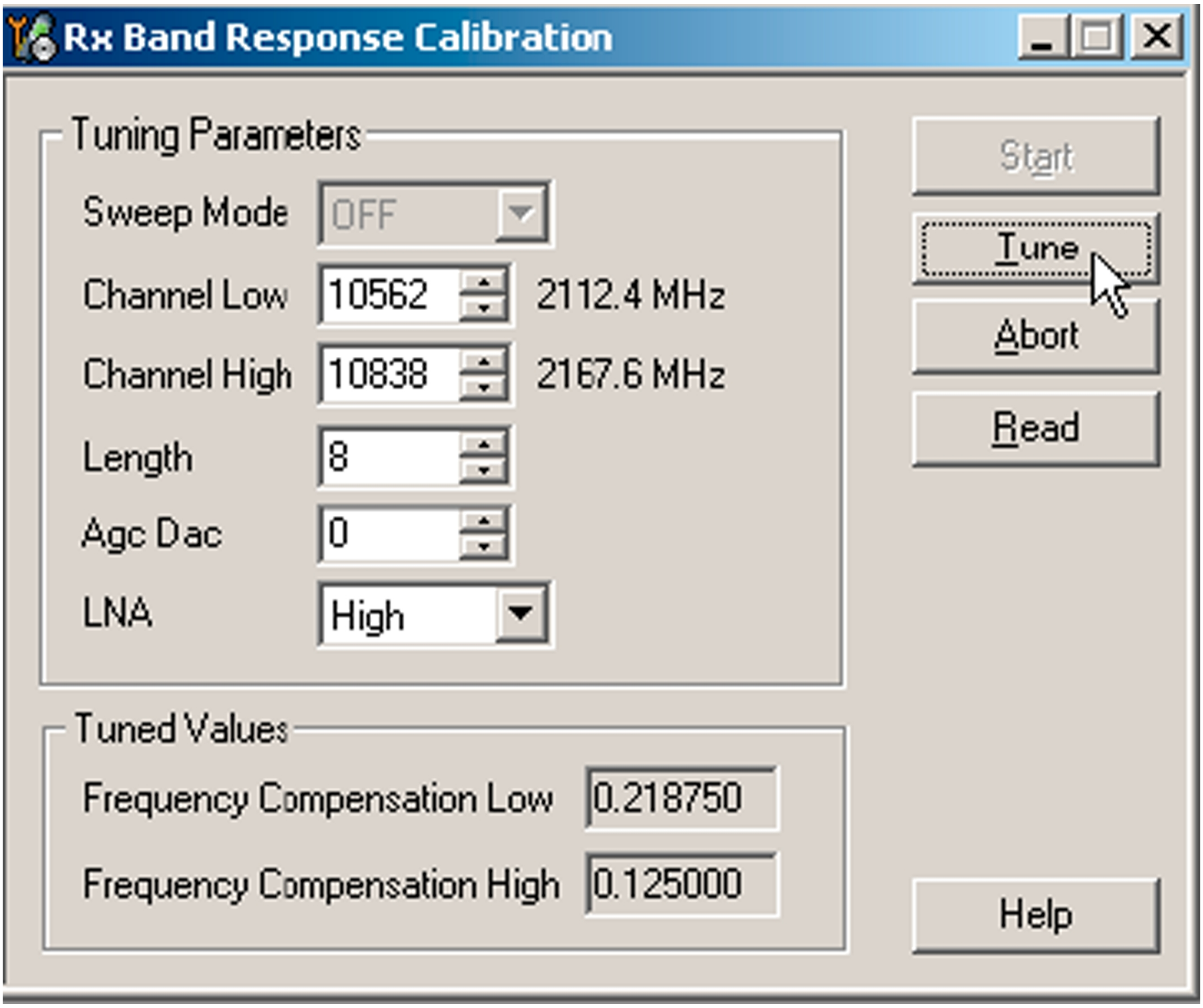
Steps

1. From the "Operating mode" dropdown menu, set mode to "Local".
2. From the Tuning menu choose WCDMA -> Rx Band Response Calibration.


Operating mode: Local

Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
Rf Channel Filter Calibration
Temperature Sensor Calibration
Rf Channel Filter Calibration
Rx AGC Alignment
Rx Band Response Calibration
TX AGC & Power Detector
Tx Band Response Calibration
Tx LO Leakage

3. Click Start and Tune.



Tuning Parameters

Sweep Mode: OFF
Channel Low: 10562 2112.4 MHz
Channel High: 10838 2167.6 MHz
Length: 8
Agc Dac: 0
LNA: High

Tuned Values

Frequency Compensation Low: 0.218750
Frequency Compensation High: 0.125000

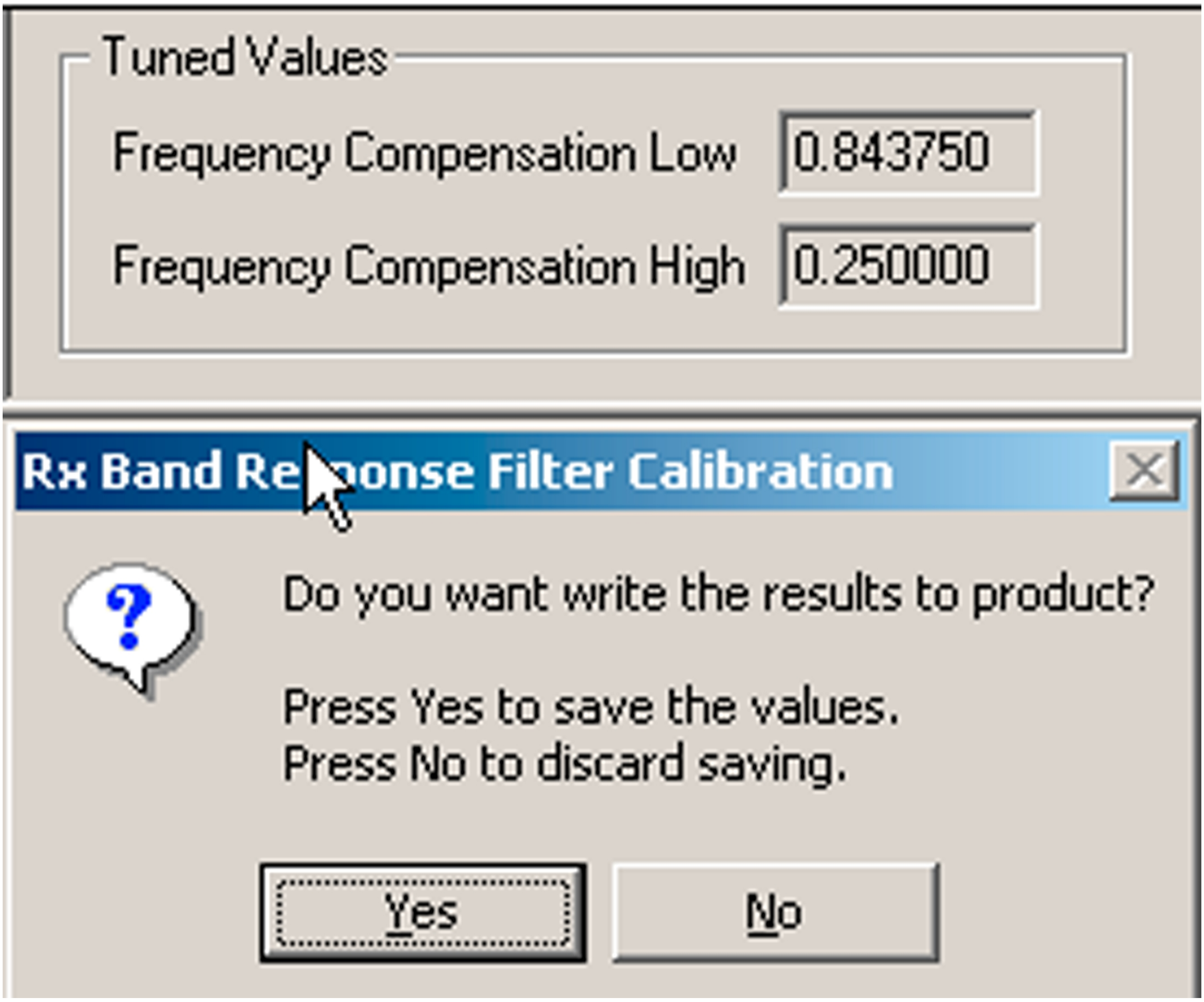
4. Setup the signal generator to correspond the values in the pop-up window:

Frequency:	2113.4MHz
Level:	–48 dBm + cable and adapter attenuations
Modulation:	FM
Deviation:	500 kHz
Modulation frequency:	50 kHz

5. Click OK.
6. Change frequency to 2166.6 MHz and click OK.
7. Check that the tuned values are within the limits specified in the table below:

	Min	Max
Frequency compensation low	-5	+5

	Min	Max
Frequency compensation high	-5	+5



Tuned Values

Frequency Compensation Low 0.843750

Frequency Compensation High 0.250000

Rx Band Response Filter Calibration

Do you want write the results to product?

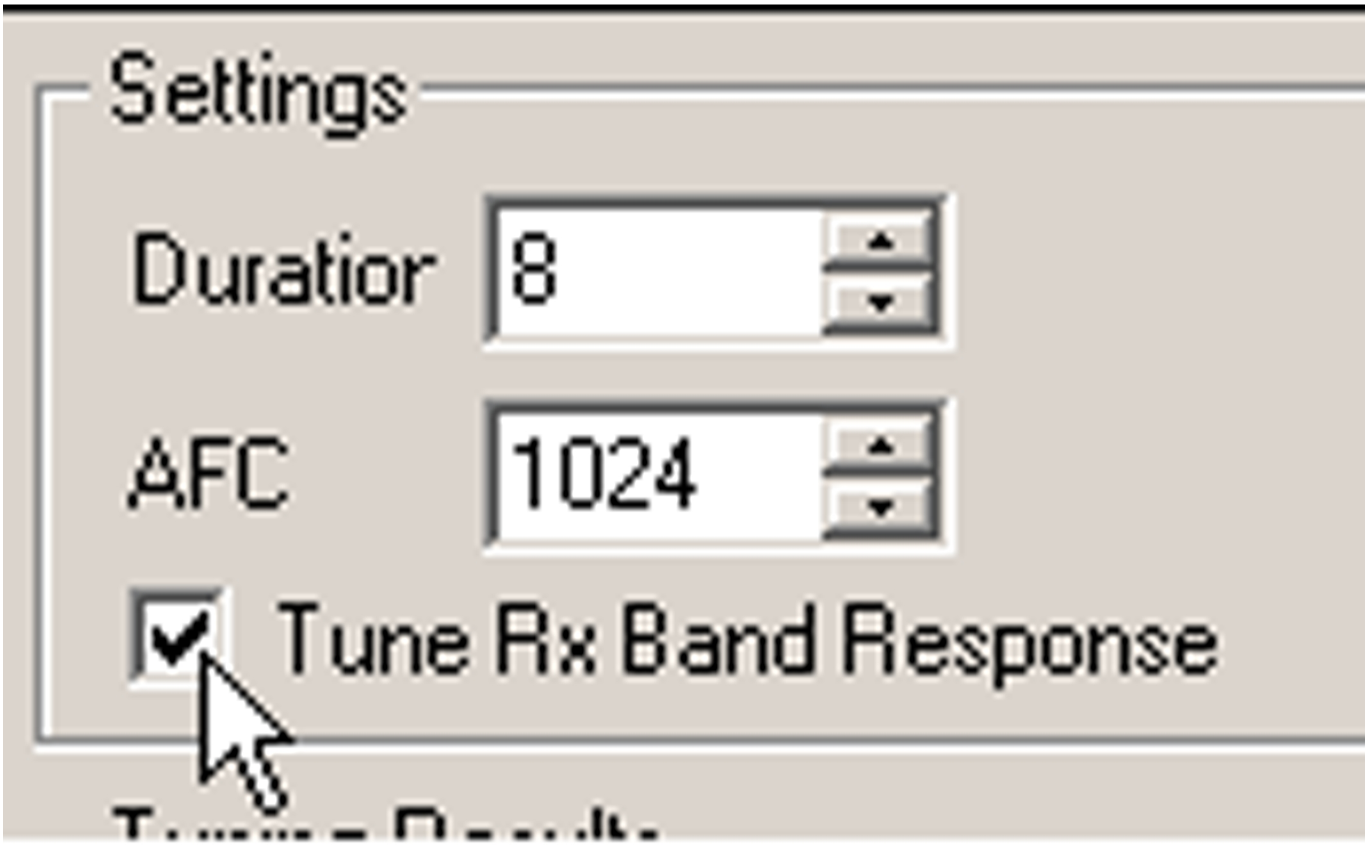
Press Yes to save the values.
Press No to discard saving.

8. If the values are OK, click Yes to save the values.
9. Close the tuning window.

Alternative steps

- From the "Operating mode" dropdown menu, set mode to "Local".
- From the Tuning menu, choose WCDMA -> Rx AGC Alignment.
- Click Start.

- Check the “Tune Rx Band Response” checkbox and click Tune.



Settings

Duratior 8

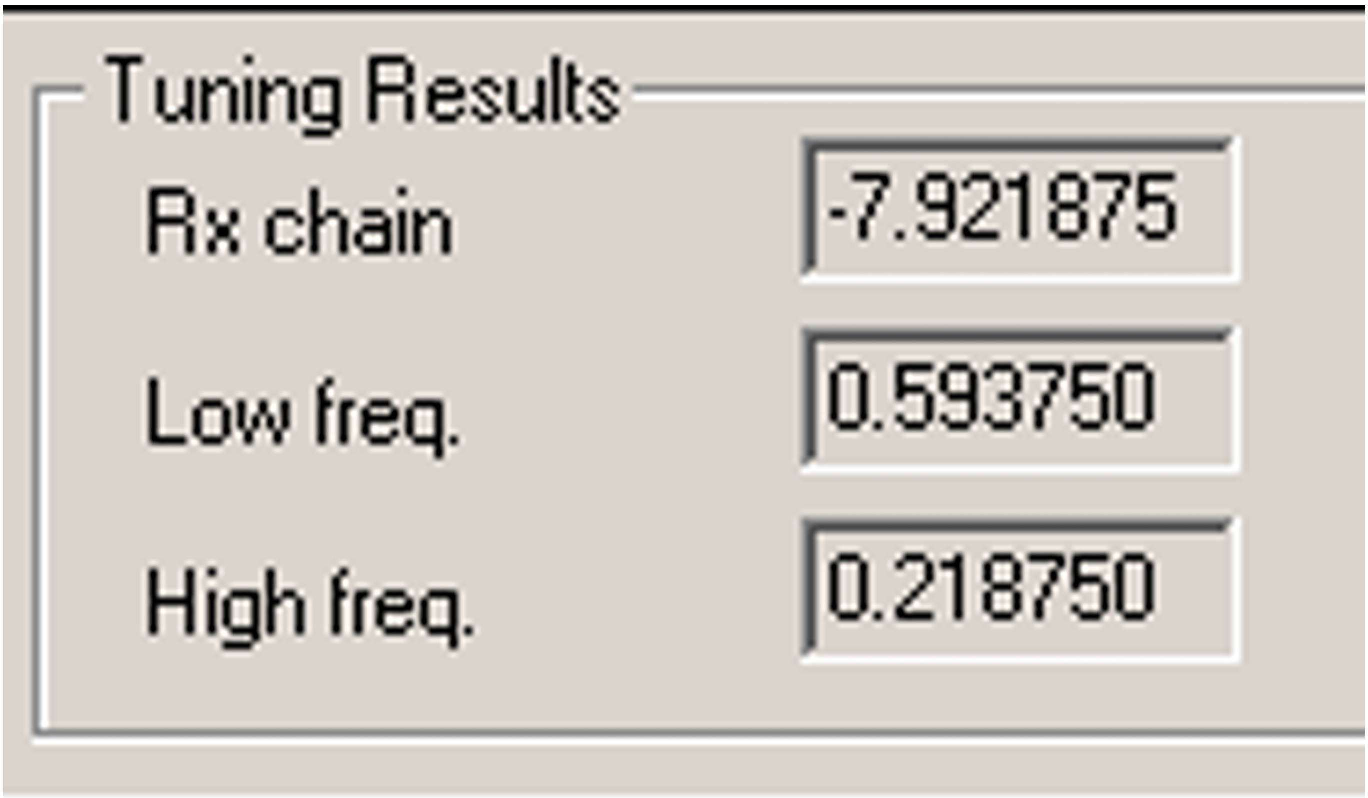
AFC 1024

☑ Tune Rx Band Response

- Setup the signal generator according to the values in the pop-up window:

Frequency list:	2113.4 MHz, 2141 MHz and 2166.6 MHz
Dwell time:	2 ms
Sweep control:	Automatic continuous sweep
Level:	–48 dBm + cable and adapter attenuations
Modulation:	FM
Deviation:	500 kHz
Modulation frequency:	50 kHz

- Click OK.
- Check that the “Rx chain” , “Low freq.” and “High freq.” values in the Tuning Results window are within the limits presented in the following table.



Tuning Results

Rx chain -7.921875

Low freq. 0.593750

High freq. 0.218750

	Min	Typ	Max	Unit
Rx chain	-6	1.5... 3.5	6	dB
Low freq	-5	-0.7...4.0	5	
High freq	-5	-0.7...4.0	5	

- If the Rx gain is acceptable, click Yes to save the results to the phone.
- To end the calibration, click Close.

WCDMA transmitter tunings

Tx AGC & power detector (WCDMA)

Context

Tx AGC & power detector tuning has two purposes:

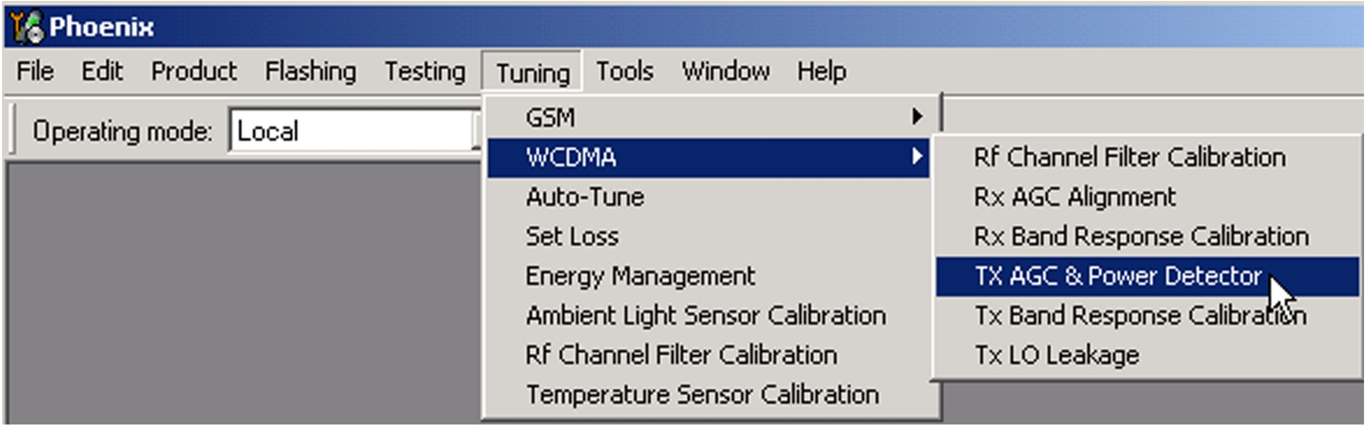
- to enable the phone to select the correct TxC value accurately in order to produce the required RF level
- to enable the phone to measure its own transmitter power accurately

There are two ways to perform the tuning. For an alternative method, see Alternative steps.

Steps

1. From the "Operating mode" dropdown menu, set mode to "Local". NOTE! After tuning is done change system mode back to Dual by choosing "Free" to Selected Sytem Mode and click Write.'

2. From the Tuning menu, choose WCDMA -> Tx AGC & Power Detector.


Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
Operating mode:
Local
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
Rf Channel Filter Calibration
Temperature Sensor Calibration
Rf Channel Filter Calibration
Rx AGC Alignment
Rx Band Response Calibration
TX AGC & Power Detector
Tx Band Response Calibration
Tx LO Leakage

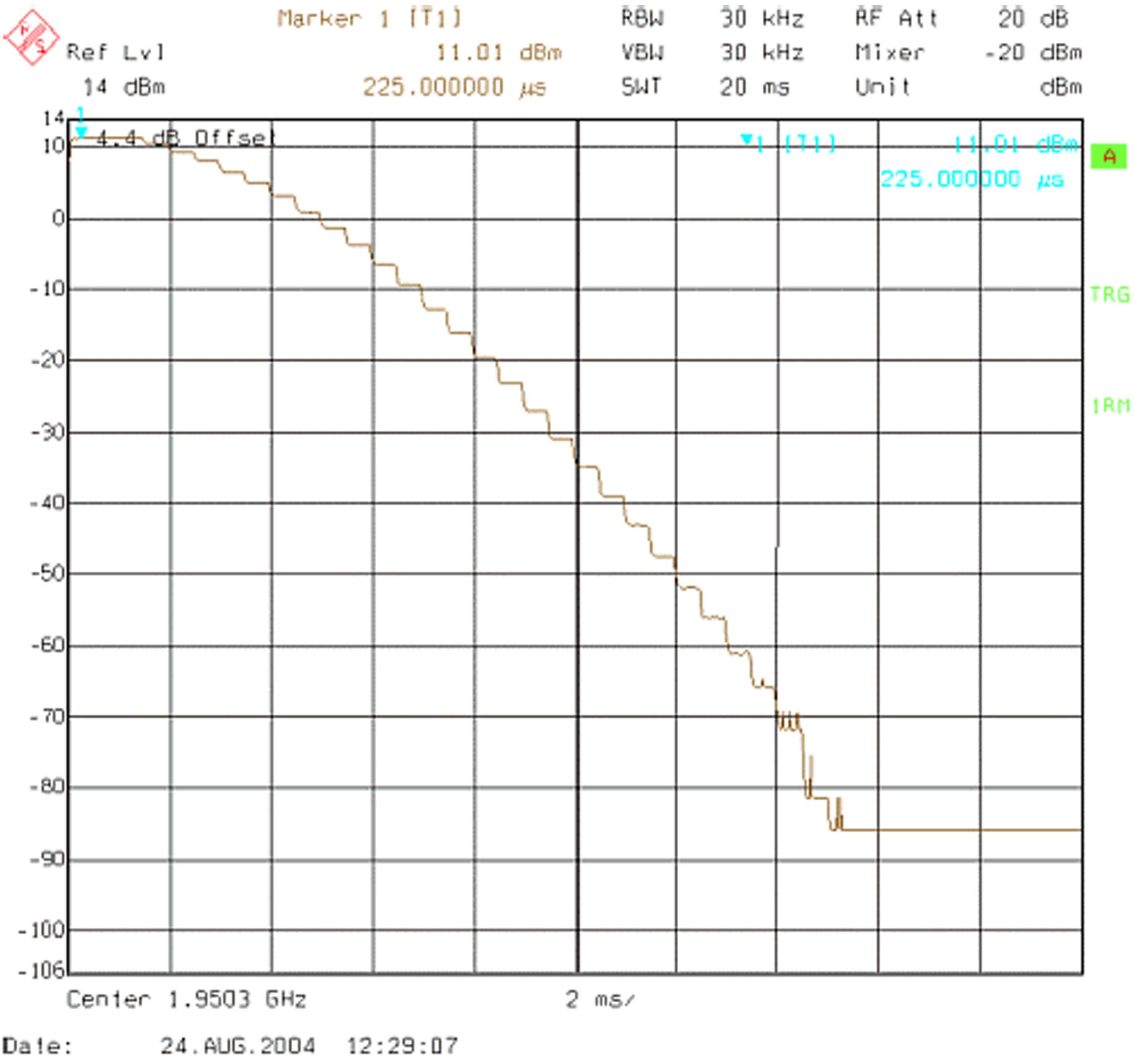
3. Click Start.
4. In the "Wide Range" pane, click Tune (the leftmost Tune button).
5. Setup the spectrum analyzer in the following way:

Center frequency:	**1950.3 MHz**
Span:	0 Hz
Reference level offset:	Cable attenuations + adapter attenuation
Reference level:	**14 dBm**
Input attenuation:	(20 dB) To minimize the noise floor, manually select as small value as possible for the mentioned reference level .
Resolution bandwidth:	30 kHz
Video bandwidth:	30 kHz
Sweep time:	20 ms
Detector:	**RMS detector**
Average:	No
Trigger:	Video
Trigger level:	0 dBm
Marker:	250 us
Marker step:	500 us

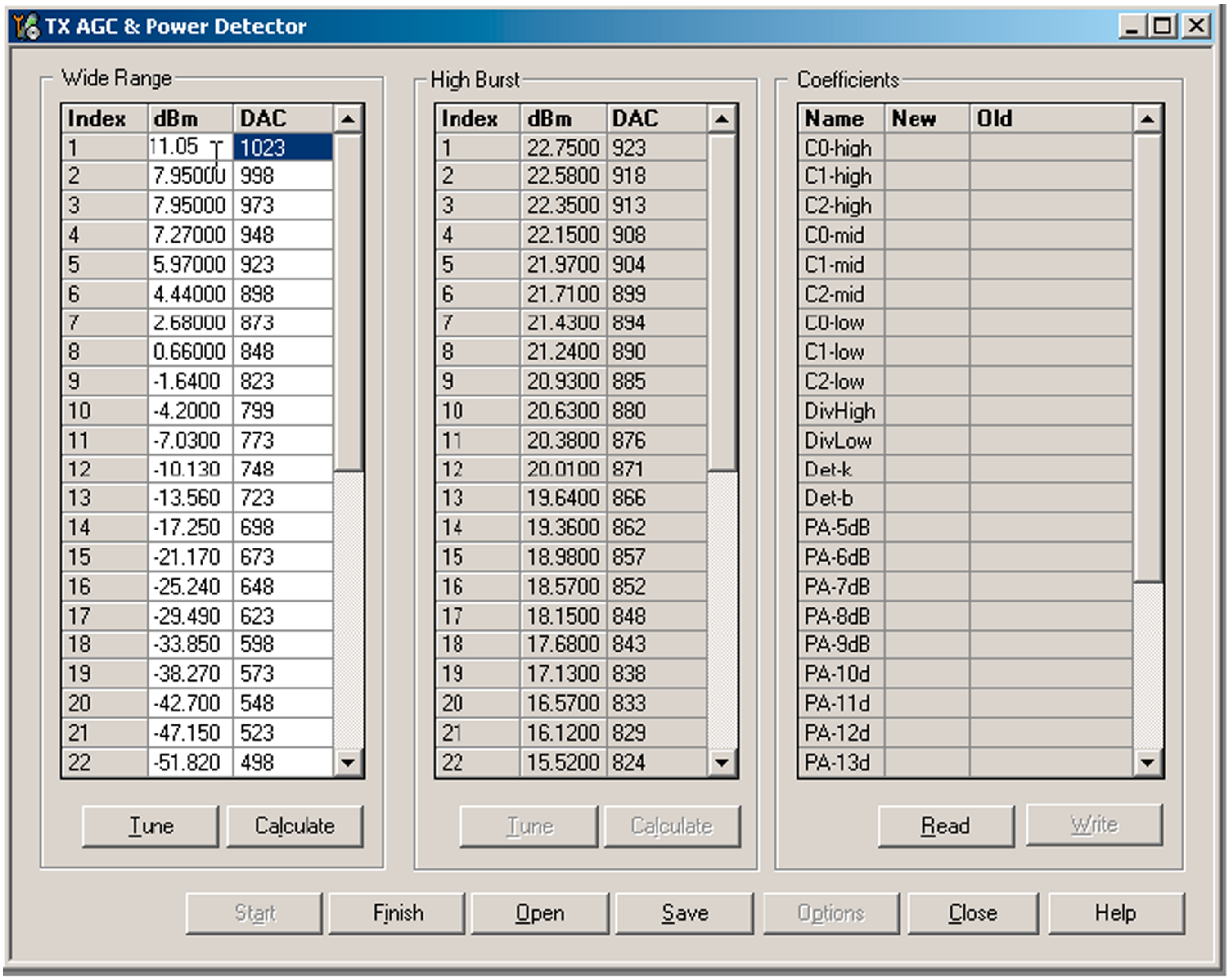
6. After setting the spectrum analyzer, click OK.
7. Measure the power levels with a marker.

Take the first measurement from 250 us after the trigger, the second from 750 us, the third on 1225 us and so on in every 500 us until the table is filled.

> **Note:** It must be possible to measure power levels down to –68 dBm. The measured power levels must be monotonously decreasing.
>
> Make sure that the marker is not measuring the level of noise spike on lower levels.


Marker 1 [T1]
Ref Lvl 14 dBm
11.01 dBm
225.000000 µs
RBW 30 kHz
VBW 30 kHz
SWT 20 ms
RF Att 20 dB
Mixer -20 dBm
Unit dBm
4.4 dB Offset
1 [T1] 11.01 dBm
225.000000 µs
A
TRG
1RM
14
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-106
Center 1.9503 GHz
2 ms/
Date: 24.AUG.2004 12:29:07

8. Fill in the power level values (in dBm) to the Wide Range table.



Wide Range

Index	dBm	DAC
1	11.05	1023
2	7.95000	998
3	7.95000	973
4	7.27000	948
5	5.97000	923
6	4.44000	898
7	2.68000	873
8	0.66000	848
9	-1.6400	823
10	-4.2000	799
11	-7.0300	773
12	-10.130	748
13	-13.560	723
14	-17.250	698
15	-21.170	673
16	-25.240	648
17	-29.490	623
18	-33.850	598
19	-38.270	573
20	-42.700	548
21	-47.150	523
22	-51.820	498

High Burst

Index	dBm	DAC
1	22.7500	923
2	22.5800	918
3	22.3500	913
4	22.1500	908
5	21.9700	904
6	21.7100	899
7	21.4300	894
8	21.2400	890
9	20.9300	885
10	20.6300	880
11	20.3800	876
12	20.0100	871
13	19.6400	866
14	19.3600	862
15	18.9800	857
16	18.5700	852
17	18.1500	848
18	17.6800	843
19	17.1300	838
20	16.5700	833
21	16.1200	829
22	15.5200	824

Coefficients

Name	New	Old
C0-high		
C1-high		
C2-high		
C0-mid		
C1-mid		
C2-mid		
C0-low		
C1-low		
C2-low		
DivHigh		
DivLow		
Det-k		
Det-b		
PA-5dB		
PA-6dB		
PA-7dB		
PA-8dB		
PA-9dB		
PA-10d		
PA-11d		
PA-12d		
PA-13d		

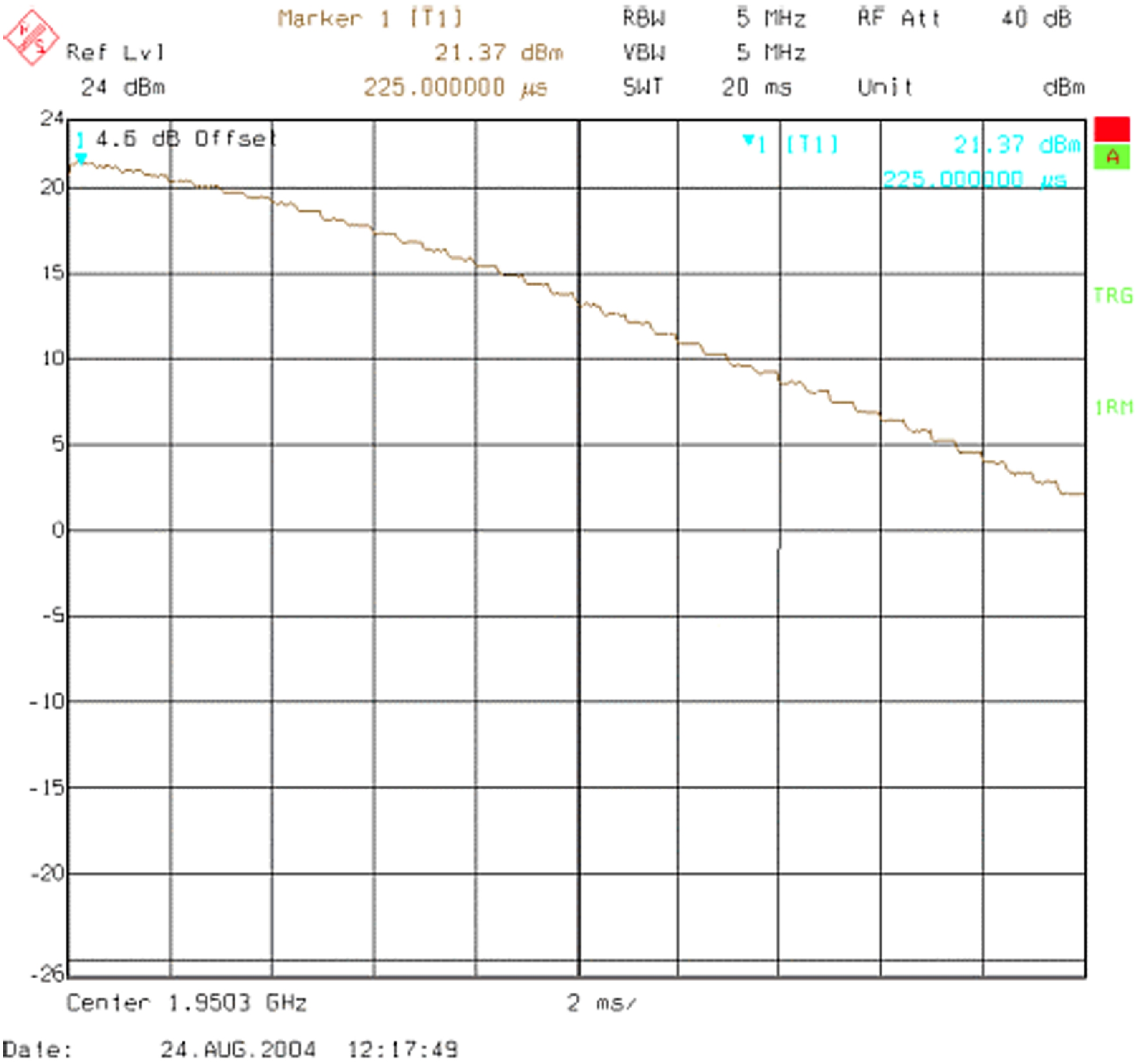
9. In the "Wide Range pane", click Calculate.
10. In the "High Burst" pane, click Tune.
11. Setup the spectrum analyzer with the following settings:

Center frequency:	**1950 MHz**
Span:	0 Hz
Reference level offset:	Cable attenuations + adapter attenuation
Reference level:	**24 dBm**
Input attenuation:	Automatic
Resolution bandwidth:	5 MHz
Video bandwidth:	5 MHz
Sweep time:	20 ms
Detector:	**RMS detector**
Average:	No

Trigger:	Video
Trigger level:	0 dBm
Marker:	250 us
Marker step:	500 us

12. Measure the power levels with a marker.

    Take the first measurement from 250 us after the trigger, the second from 750 us, third on 1225 us and so on in every 500 us until the table is filled.



Marker 1 [T1]
21.37 dBm
225.000000 µs

Ref Lvl
24 dBm

RBW 5 MHz
VBW 5 MHz
SWT 20 ms

RF Att 40 dB
Unit dBm

1 4.6 dB Offset

▼1 [T1] 21.37 dBm
225.000000 µs

Center 1.9503 GHz
2 ms/

Date: 24.AUG.2004 12:17:49

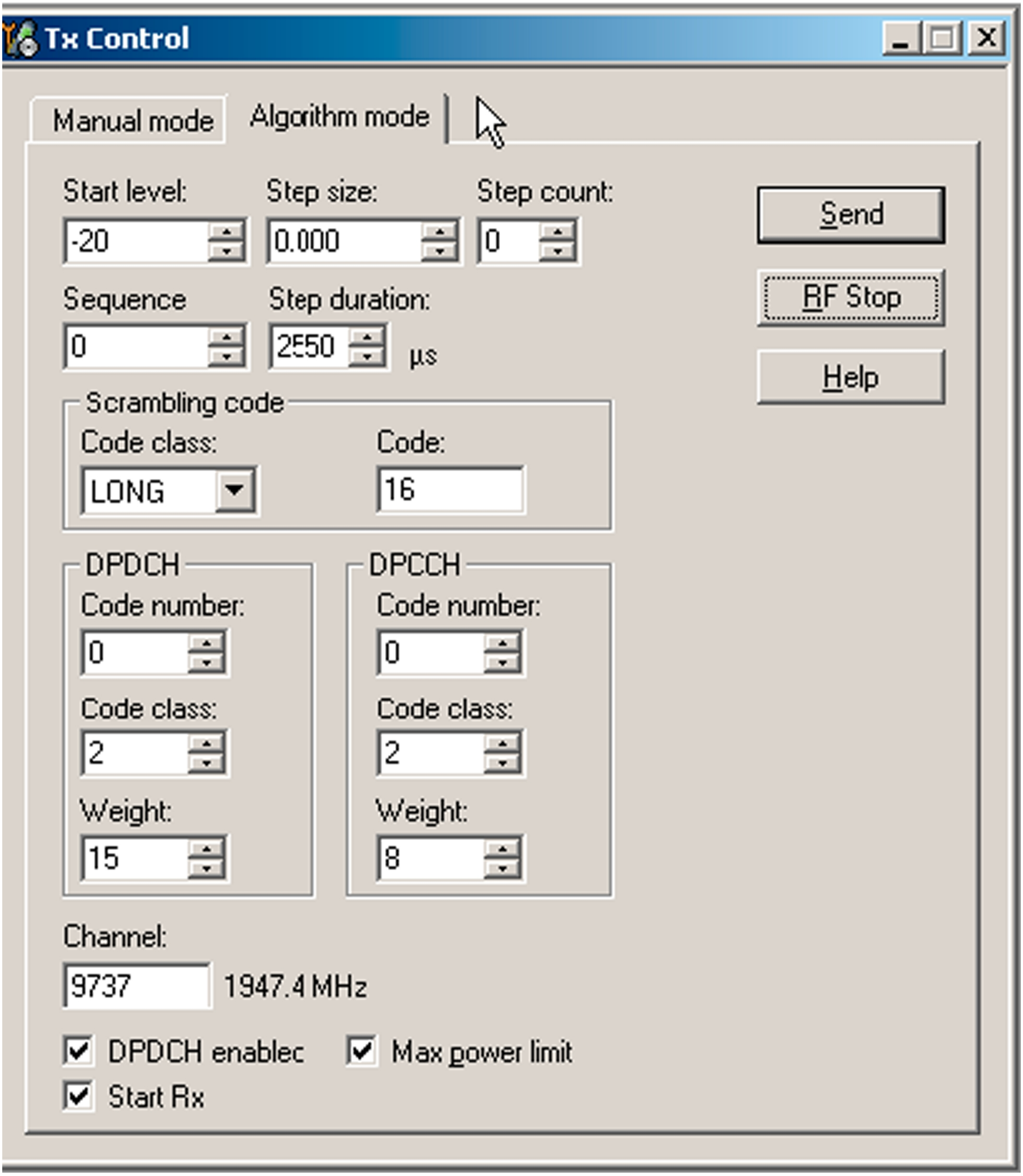
Figure 64 High burst measurement

13. In the "High Burst" pane, click Calculate.
14. Check that the calculated values are within the limits specified in the following table:

	Min	Max
C0-high	-0.5	5
C1-high	-50	50
C2-high	400	900
C0-mid	-0.7	0.7
C1-mid	0	50
C2-mid	400	900
C0-low	-4	4
C1-low	-400	440
C2-low	-10000	15000
Det-k	0	800
Det-b	-1000	1000

15. To save the coefficients to the phone, click Write.
16. To close the tuning window, click Close.
17. From the Testing menu, choose WCDMA -> Tx Control.

18. Select the Algorithm mode tab.



Start level: -20
Step size: 0.000
Step count: 0
Sequence 0
Step duration: 2550 µs

Scrambling code
Code class: LONG
Code: 16

DPDCH
Code number: 0
Code class: 2
Weight: 15

DPCCH
Code number: 0
Code class: 2
Weight: 8

Channel: 9737 1947.4 MHz

☑ DPDCH enablec
☑ Max power limit
☑ Start Rx

19. Write the target power level 25 dBm to the "Start level" line and check the "Max power limit" check box (detector calibration check).
20. Setup the spectrum analyzer with the following settings:

Center frequency:	**1950.0 MHz**
Span:	0 Hz
Reference level offset:	Cable attenuations + adapter attenuation
Reference level:	**24 dBm or -20 dBm depending on the level measured**
Input attenuation:	Automatic
Resolution bandwidth:	5 MHz
Video bandwidth:	5 MHz
Sweep time:	20 ms
Detector:	**RMS detector**
Average:	No
Trigger:	Free run

21. Click Send.
22. Measure the WCDMA output power.

    It should be around 21 dBm.
23. Click RF Stop and uncheck the "Max power limit" checkbox.
24. Repeat steps 19 to 23 for levels +19, +7, 0, -20 and –40 dBm levels.

    The measured output power may not differ more than +-2 dB from the requested value at level +19dBm and no more than +-4dB on lower levels.

    Remember to stop the RF before sending new data.

Alternative steps

- Measure the wide range levels normally and write down the levels that are possible to measure.
- Click Finish.
- Click Options.
- Change the first wide range DAC value to 573 and change the number of tuning steps to 21.
- Change the spectrum analyzer reference level to –20 dBm and adjust the input attenuator to the lowest value possible.
- In the "Wide Range" pane, click Tune and fill in the rest of values starting from the 19th level.

Tx band response calibration (WCDMA)

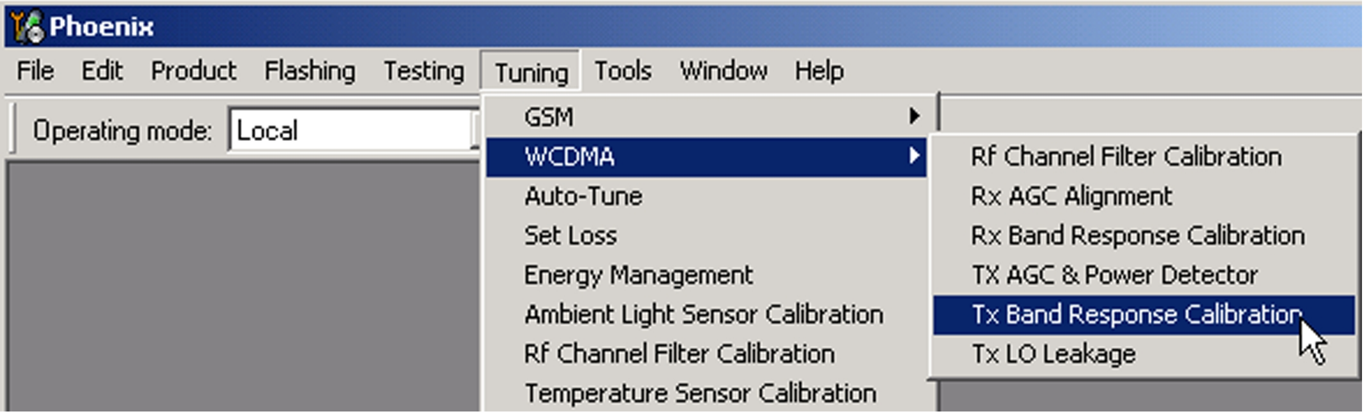
Context

Tx band response calibration is required to get compensation parameters for DSP algorithm in order for it to handle frequency response variations (caused by SAW filter, PA and duplexer unidealities) in open loop power control and maximum power limitation situations.

Steps

1. From the "Operating mode" dropdown menu, set mode to "Local". NOTE! After tuning is done change system mode back to Dual by choosing "Free" to Selected System Mode and click Write.'

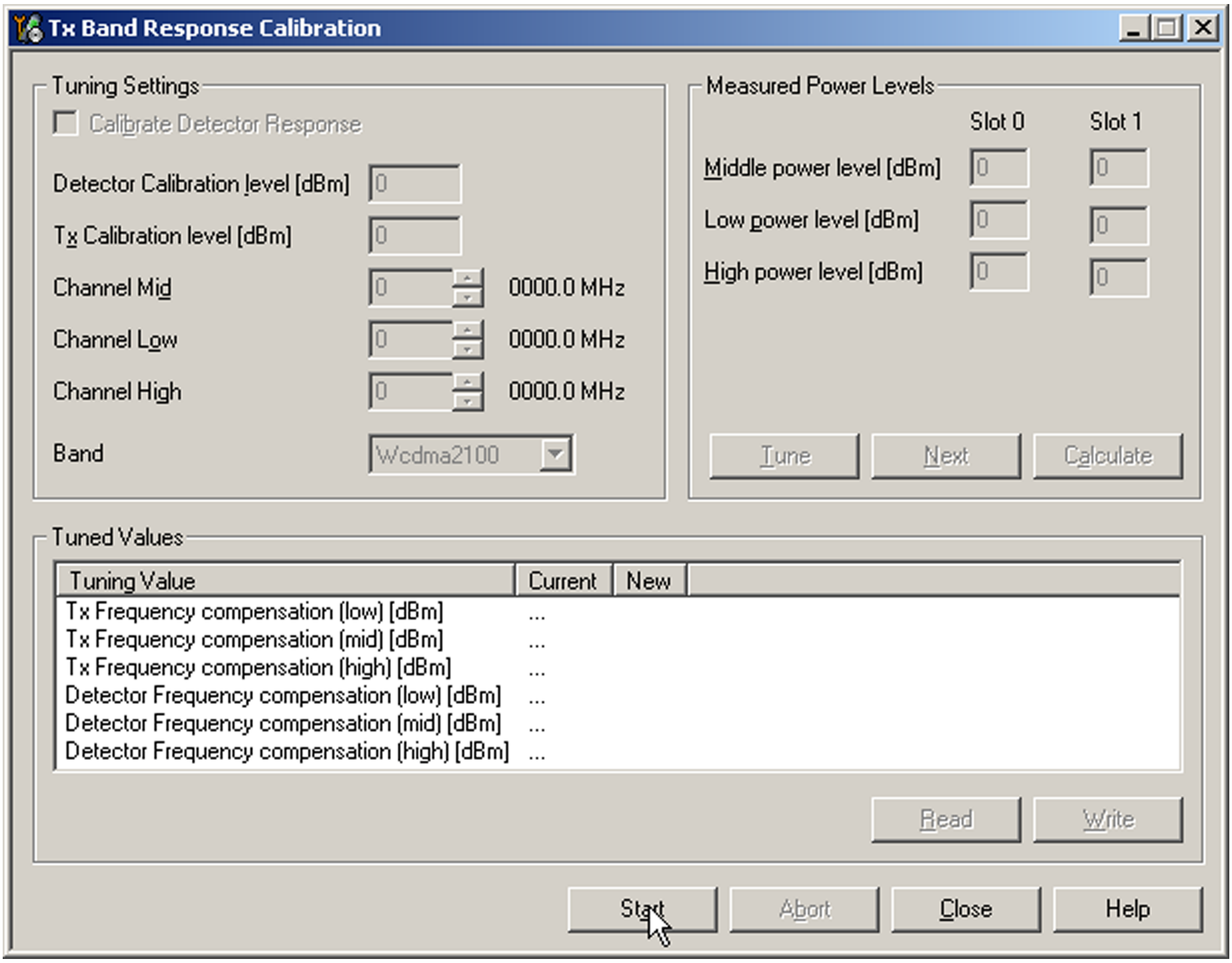
2. From the Tuning menu, choose WCDMA -> Tx Band Response Calibration.


Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
Operating mode:
Local
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
Rf Channel Filter Calibration
Temperature Sensor Calibration
Rf Channel Filter Calibration
Rx AGC Alignment
Rx Band Response Calibration
TX AGC & Power Detector
Tx Band Response Calibration
Tx LO Leakage

3. Setup the spectrum analyzer according to the following settings:

Frequency:	1950.3 MHz
Span:	100 MHz
Reference level offset:	Cable attenuations + adapter attenuation
Reference level:	30 dBm
Input attenuation:	Default
Resolution bandwidth:	more than 4.7 MHz (i.e. 5MHz)
Video bandwidth:	more than 4.7 MHz (i.e. 5MHz)
Trigger:	Free run
Markers:	1922.4 MHz, 1950.0 MHz and 1977.6 MHz

4. Click Start and OK.


Tx Band Response Calibration
Tuning Settings
☐ Calibrate Detector Response
Measured Power Levels
Slot 0
Slot 1
Tune
Next
Calculate
Tuned Values
Read
Write
Start
Abort
Close
Help

Detector Calibration level [dBm] 0
Tx Calibration level [dBm] 0
Channel Mid 0 0000.0 MHz
Channel Low 0 0000.0 MHz
Channel High 0 0000.0 MHz
Band Wcdma2100

	Slot 0	Slot 1
Middle power level [dBm]	0	0
Low power level [dBm]	0	0
High power level [dBm]	0	0

Tuning Value	Current	New
Tx Frequency compensation (low) [dBm]	...	
Tx Frequency compensation (mid) [dBm]	...	
Tx Frequency compensation (high) [dBm]	...	
Detector Frequency compensation (low) [dBm]	...	
Detector Frequency compensation (mid) [dBm]	...	
Detector Frequency compensation (high) [dBm]	...	

5. Adjust the "Mid Channel Power Level" to 21.0 dBm.
6. Click Accept and OK.
7. Read the marker power level on the low channel and fill it in to the “Low Power Level” line.
8. Click Accept and OK.
9. Read the marker power level on the high channel and fill it in to the “High Power Level” line.
10. Click Accept.
11. Check that the tuned values are within the limits presented in the following table. If they are OK, click Yes.

	Min	Max
Tx Freq Comp (the first and last value)	-4	+4

12. Close the tuning window.

Tx LO leakage (WCDMA)

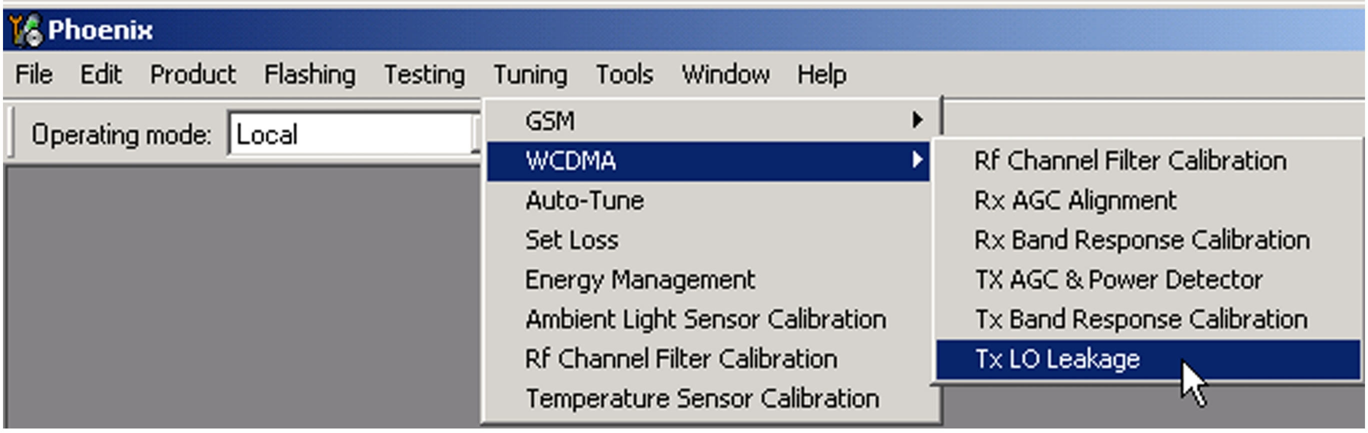
Context

The purpose of Tx LO leakage tuning is to minimize the carrier leakage of the IQ-modulator which is caused by the DC offset voltages in the Tx IQ-signal lines and in the actual IQ-modulator.

The tuning improves WCDMA Tx AGC dynamics at low power levels. A self-calibration routine selects the best combination for internal control words in order to produce minimum LO leakage.

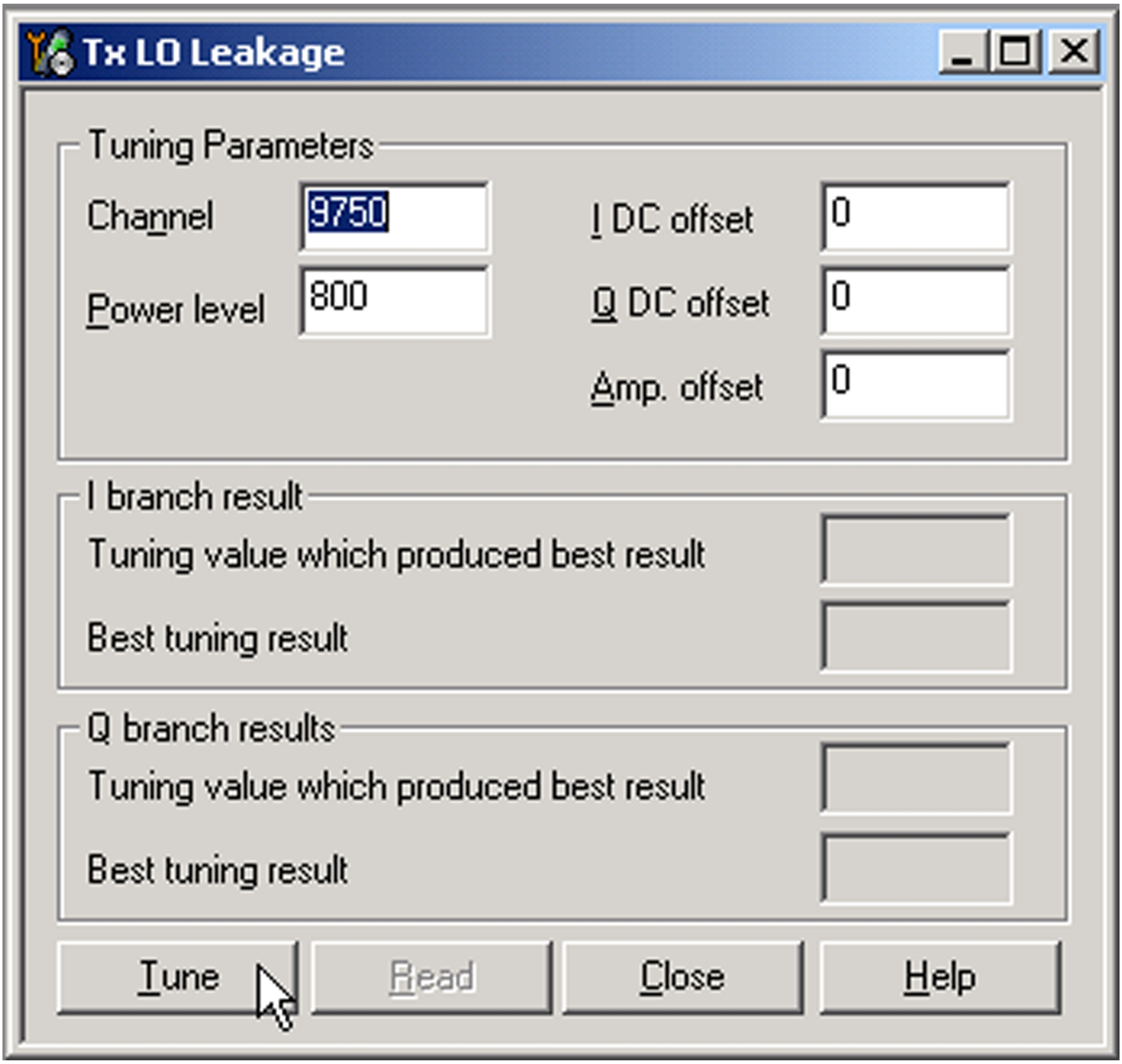
Steps

1. From the "Operating mode" dropdown menu, set mode to "Local" from Product/System Mode menu, choose "WCDMA" to Selected System Mode and click Write. NOTE! After tuning is done change system mode back to Dual by choosing "Free" to Selected System Mode and click Write.
2. From the Tuning menu, choose WCDMA -> Tx LO Leakage.


Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
Rf Channel Filter Calibration
Temperature Sensor Calibration
Rf Channel Filter Calibration
Rx AGC Alignment
Rx Band Response Calibration
TX AGC & Power Detector
Tx Band Response Calibration
Tx LO Leakage

Operating mode: Local

3. Click Tune.



Tx LO Leakage

Tuning Parameters

Channel: 9750

Power level: 800

I DC offset: 0

Q DC offset: 0

Amp. offset: 0

I branch result
Tuning value which produced best result
Best tuning result
Q branch results
Tuning value which produced best result
Best tuning result
Tune
Read
Close
Help

4. To end the tuning, click Close.

RF engine shield opening and closing instructions

Opening and closing the RF engine shield

Caution: Because the RF shields prevent signals leaking outside and possible interference to other devices, it is important that if the shield needs to be opened, it must be closed very carefully.

Note: If you need to remove the RF engine shield lid, always replace it with a new one.

Context

The RF engine shield of the RM-42 transceiver is located under the SIM connector and because of that is awkward to replace.

See the following instructions on how to open and close the shield correctly, without removing the SIM connector.

Steps

1. Open the lock pins by spreading them outwards from the shield lid.

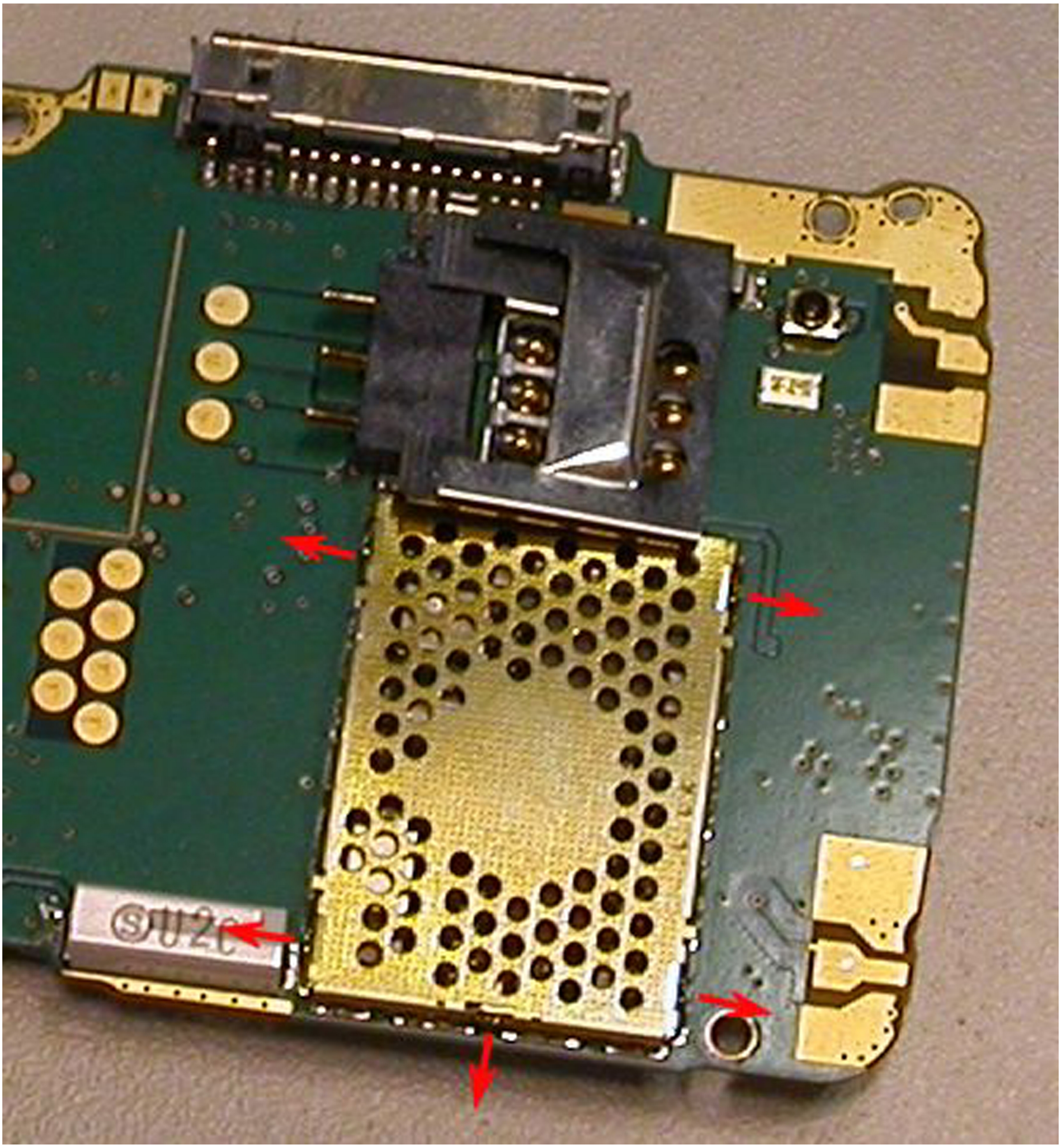


Figure 65 Opening the lock pins

2. Carefully pick the shield lid up and move it to the antenna pads' direction.

3. Bend one of the lock pins and the area around it (see the following two figures) 90 degrees up to the same level as the shield lid. But beware that the shield itself will not bend!

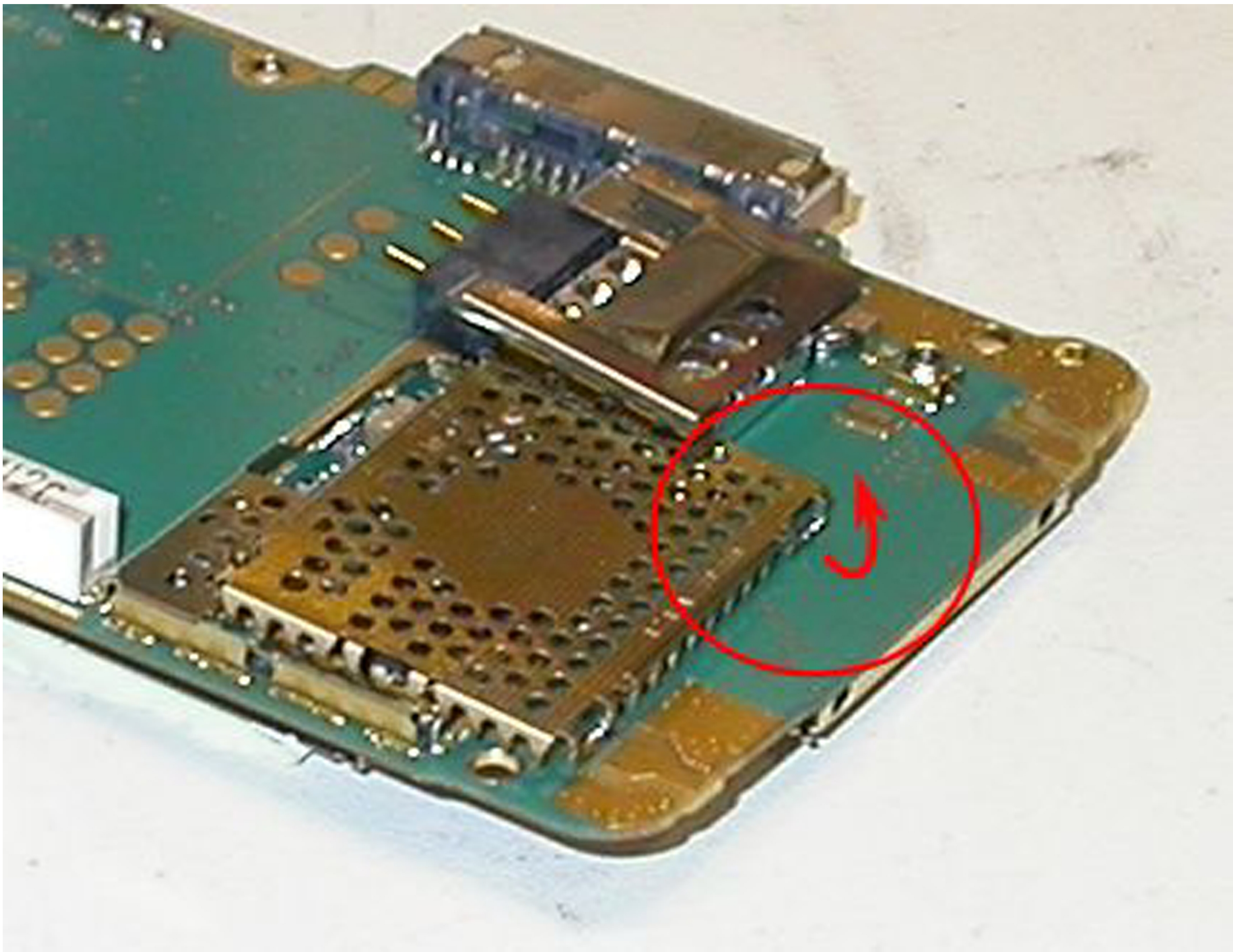


Figure 66 Bending the lock pin and the area around it

4. Slide the shield lid carefully to the direction of the type label, over the bluetooth antenna.

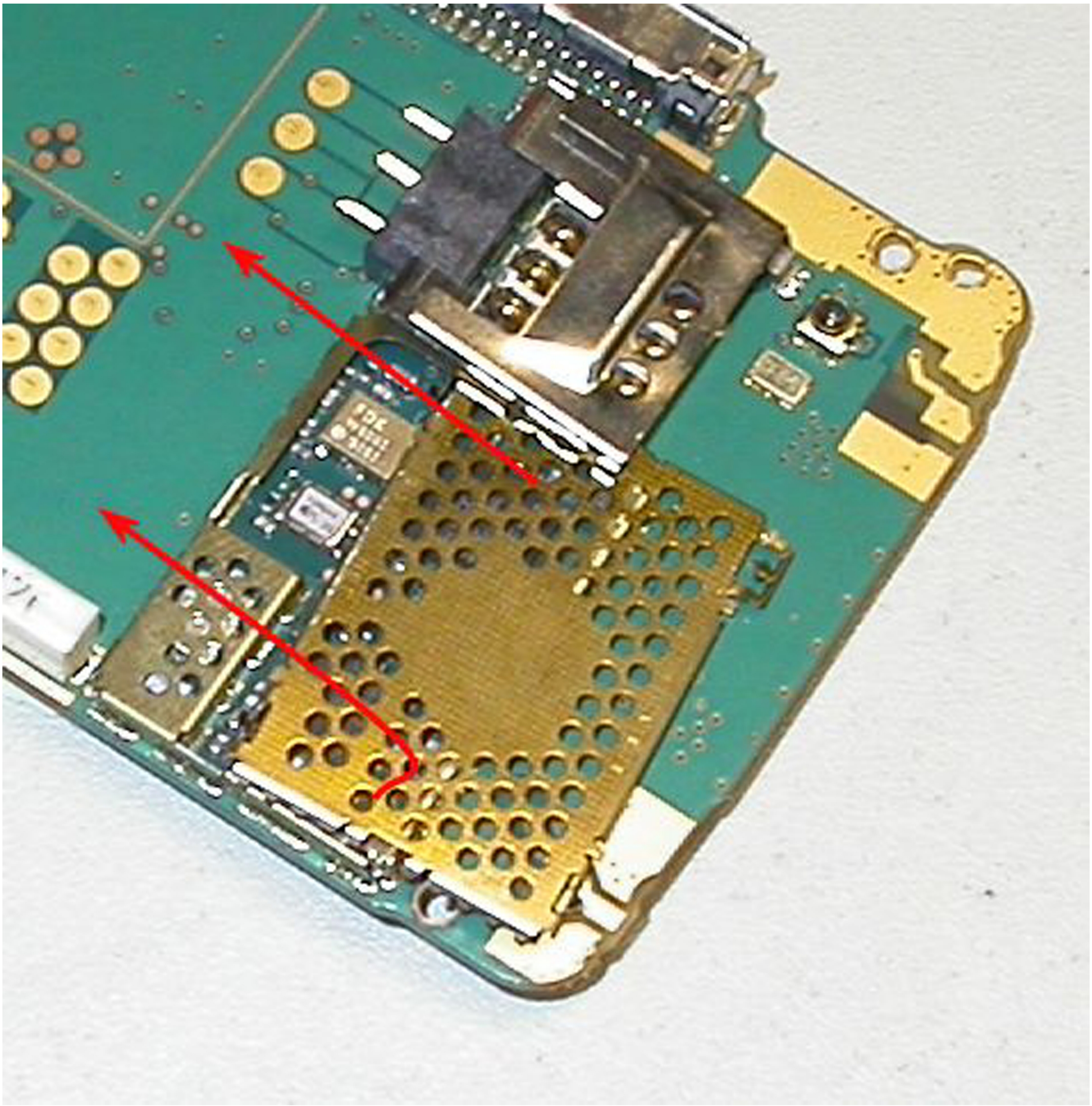


Figure 67 Sliding the shield lid

5. Now the shield lid is removed and the measurement and repair work can begin.

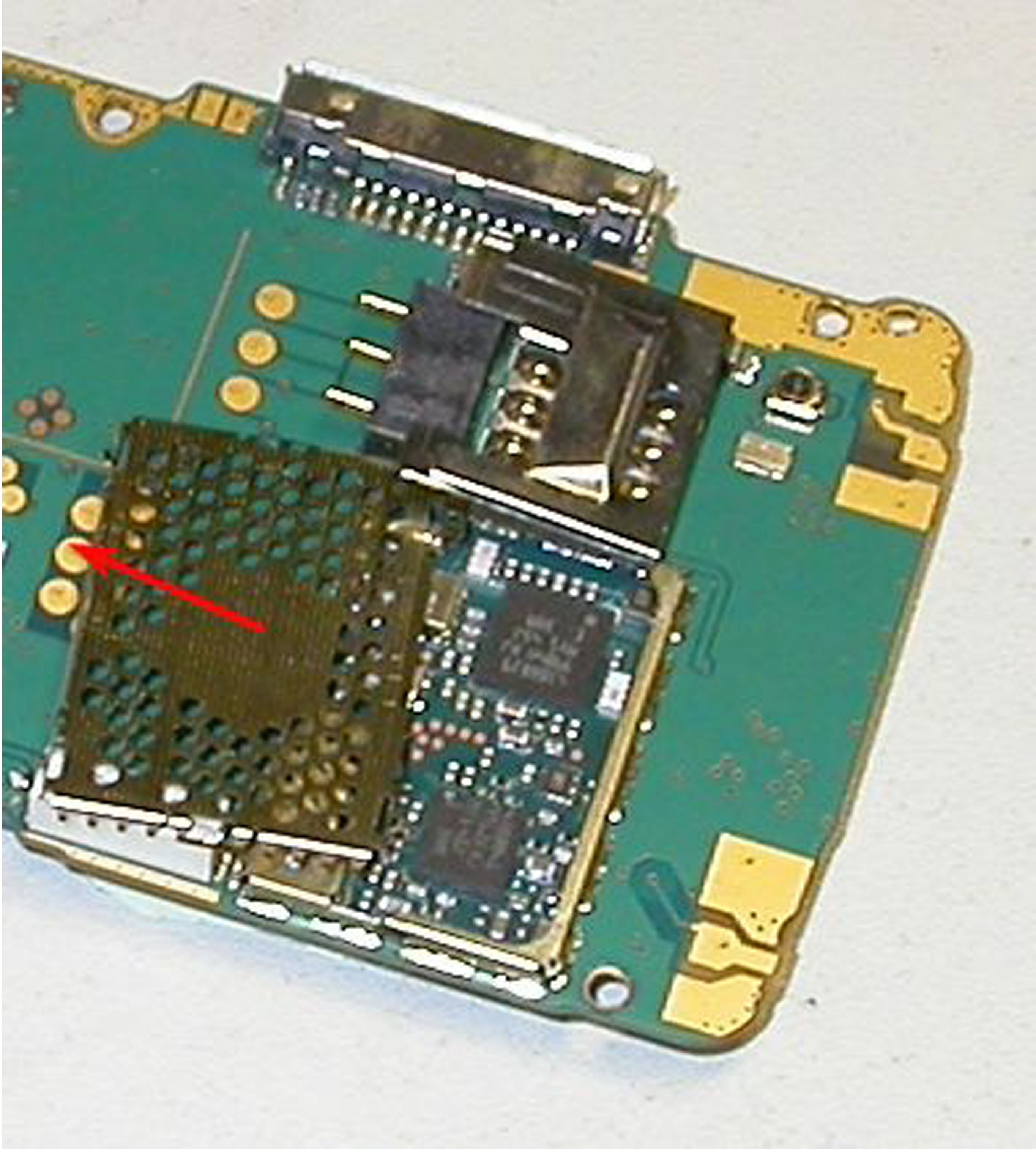


Figure 68 Removing the shield lid

6. Bend the lock pins back to the same level as the sides of the shield lid.

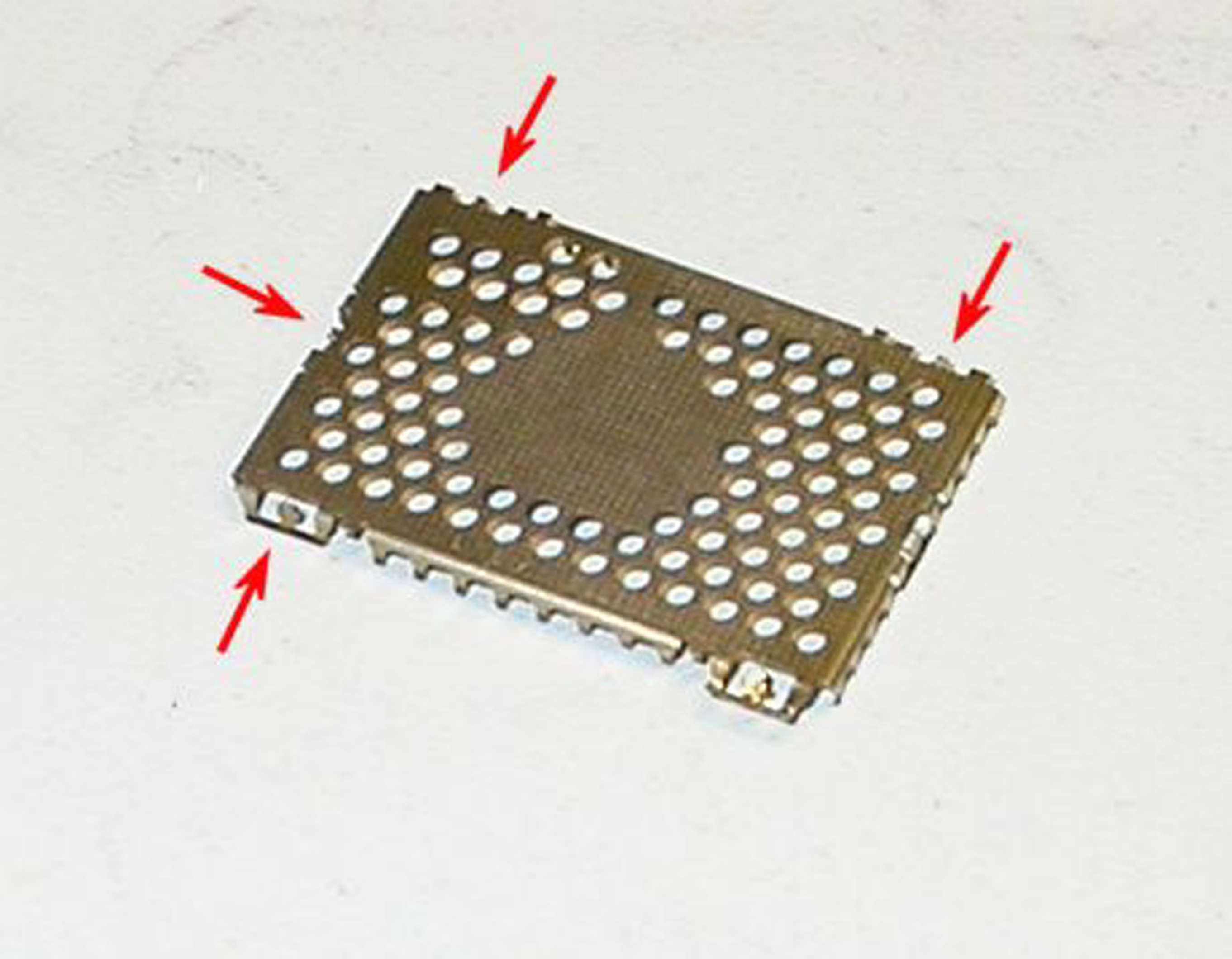


Figure 69 Bending the lock pins

7. Squeeze every side of the shield lid a little bit to the inside of the shield lid, for example with the back of a tweezers. Be very careful that the shield itself does not bend.

   Note: It is very important to do the tightening in order to prevent any signal leakage!

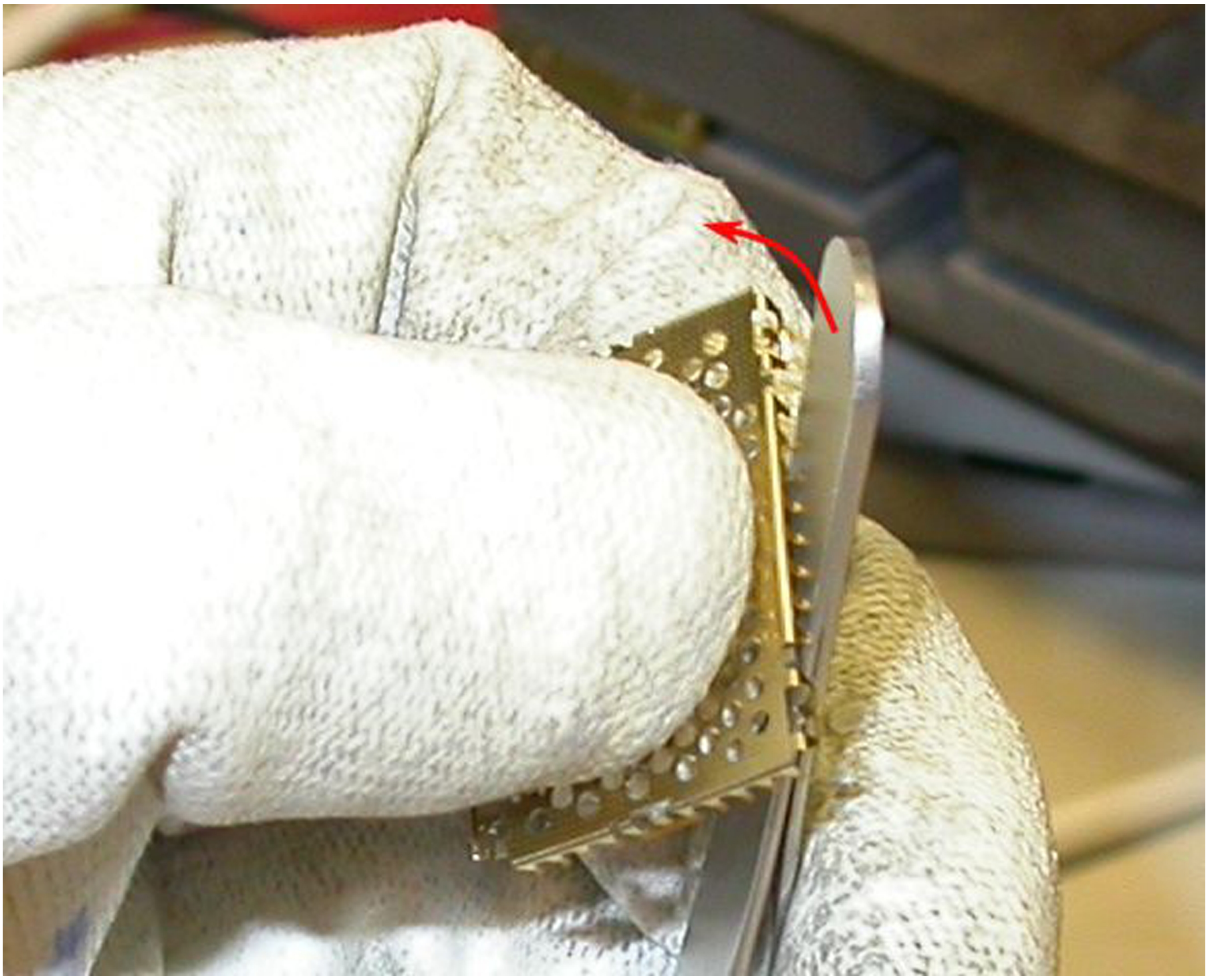


Figure 70 Squeezing the sides of the shield lid

8. Slide the shield lid over the bluetooth antenna to the direction of the antenna pads. Just like in step four, but in reverse direction.

9. Bend the bent lock pin and the area around it to the same level as the side of shield lid. Be very careful that the shield itself does not bend.

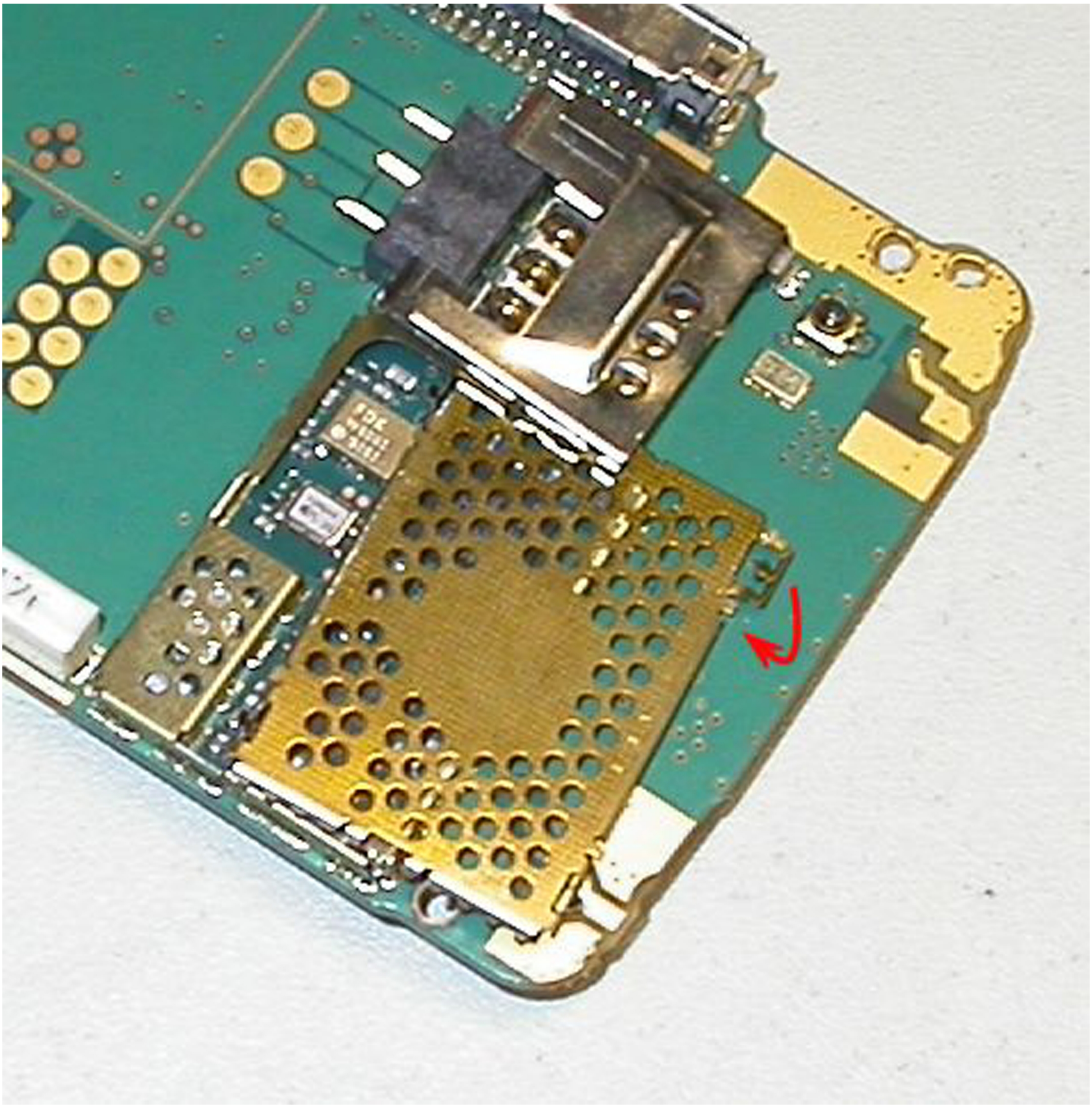


Figure 71 Bending the lock pin and the area around it

10. Slide the shield lid over the shield frame and push it in place for example with your thumb or the back of a tweezers.

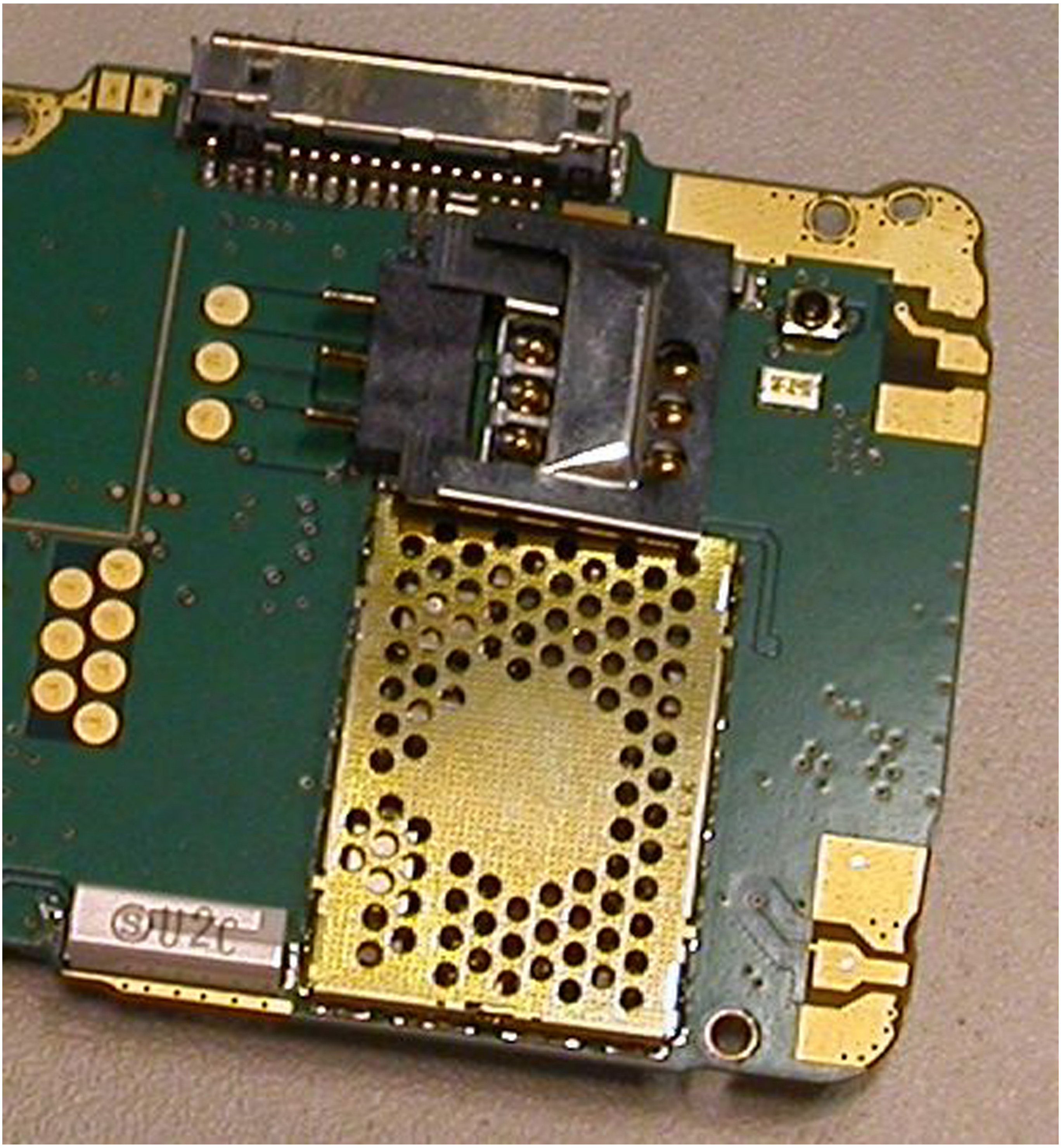


Figure 72 The shield lid in place

11. Ensure that all lock pins are in place and the shield lid is properly attached to the shield frame.

    Note: Make sure that there is no gap between the shield lid and the frame!

Appendix A: Additional RF Troubleshooting Instructions

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1. USING THESE INSTRUCTIONS

The following sections include lots of headings and subheadings that are asking simple positive style questions.

For example heading 4.2 asks if the phone does measure RSSI-values correctly in GSM-bands. If the answer is “Yes” then user should go to the next heading on the same level (heading number that has as many decimal numbers as the heading 4.2) In our example case moving to the section 4.3. If the answer is “No” then user should go to one heading level deeper in hierarchical system meaning the section 4.2.1 in our example case.

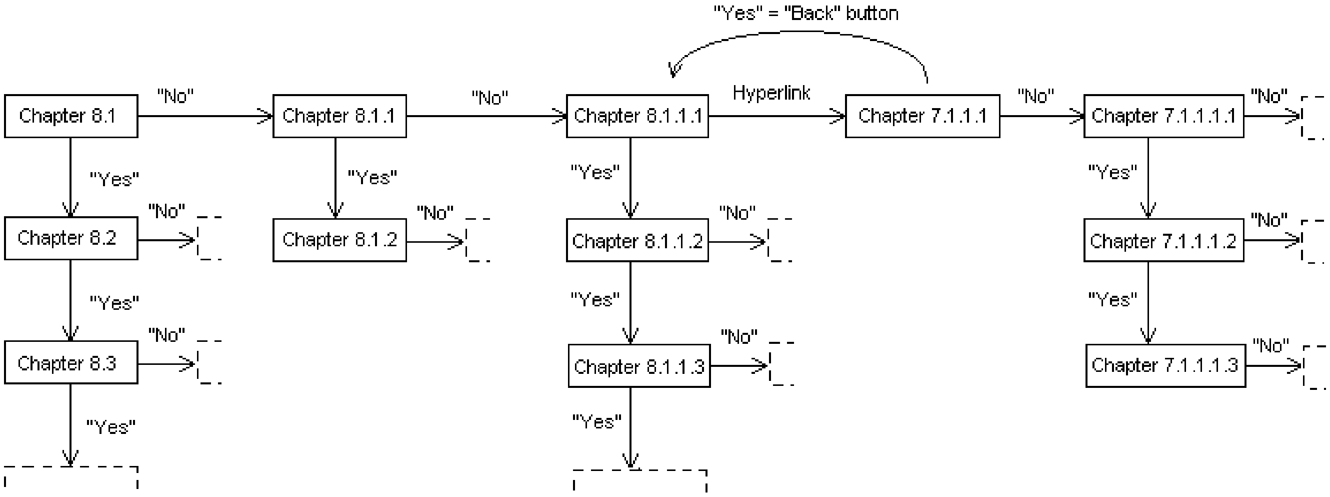

"Yes" = "Back" button
Chapter 8.1
"No"
Chapter 8.1.1
"No"
Chapter 8.1.1.1
Hyperlink
Chapter 7.1.1.1
"No"
Chapter 7.1.1.1.1
"No"
"Yes"
"Yes"
"Yes"
"Yes"
Chapter 8.2
"No"
Chapter 8.1.2
"No"
Chapter 8.1.1.2
"No"
Chapter 7.1.1.1.2
"No"
"Yes"
"Yes"
"Yes"
Chapter 8.3
"No"
Chapter 8.1.1.3
"No"
Chapter 7.1.1.1.3
"No"
"Yes"
"Yes"

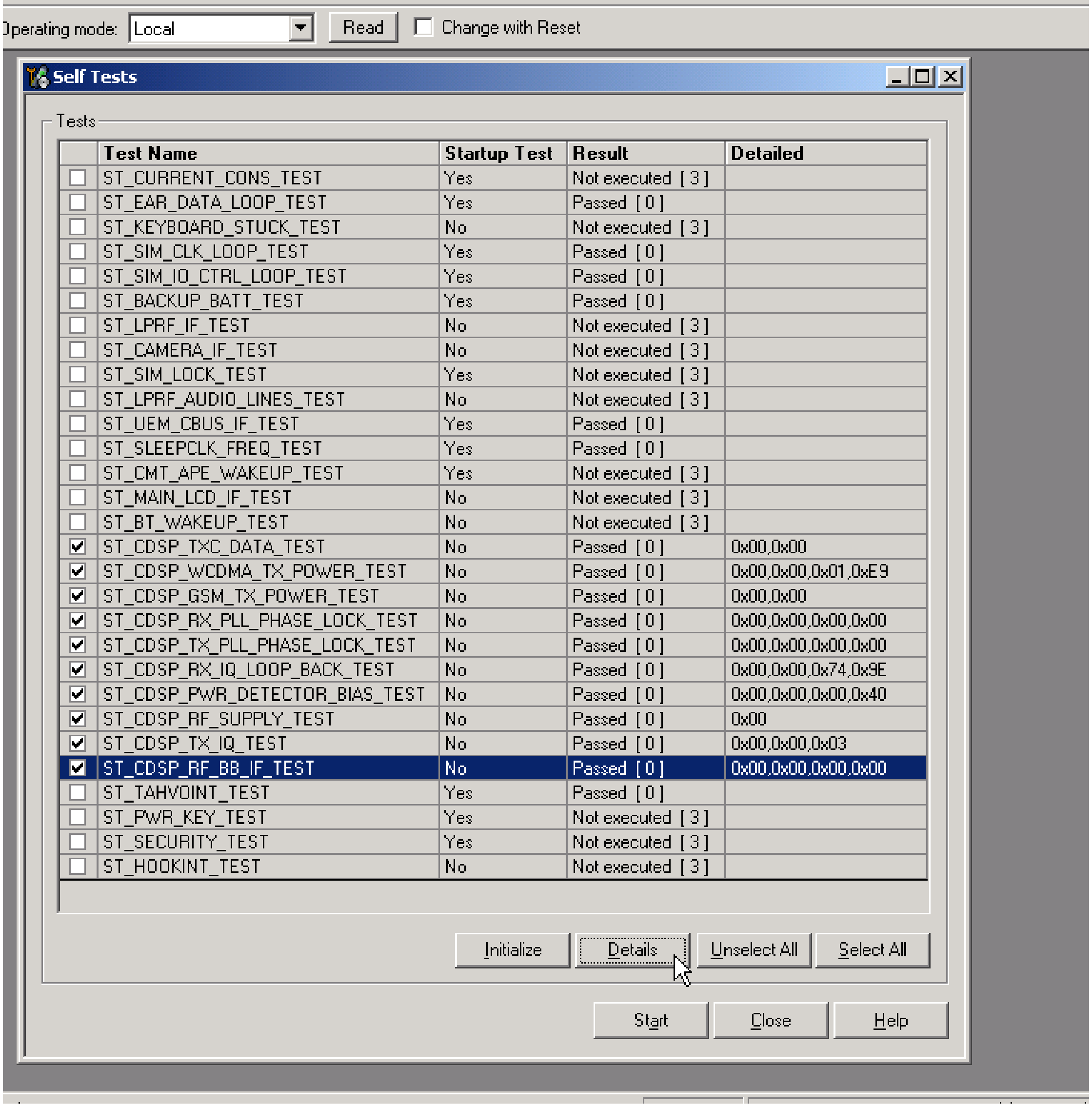
Figure 1 Use of this troubleshooting manual presented with an example. Notice that real section numbers are not used.

2. RF SELF TESTS

The RF part of the device is equipped with self test functionality which tests most of RF-BB interface signals and some parts of RF circuitry. Self tests are designed to detect faults on some critical parts, but they can not prove that everything is OK even if all the self tests are passed.

Self-tests can be run with Phoenix service software. Tests can return pass/fail result and detailed measurement data and error codes in fail case. Select “Testing” -> “Self Tests” from the Phoenix menu. Select appropriate RF self tests and run them with “Start”-button. Notice that self tests should be run in “Local”-mode (change “Operating Mode” to “Local” in Phoenix before running self tests). For service tool usage instructions refer to the “Service Software” and “Service Tools and Service Concepts” sections.

NOTICE! Perform WCDMA transmitter self test (ST_CDSP_WCDMA_TX_POWER_TEST) always in an RF shielded environment (for example in an RF-shield box).



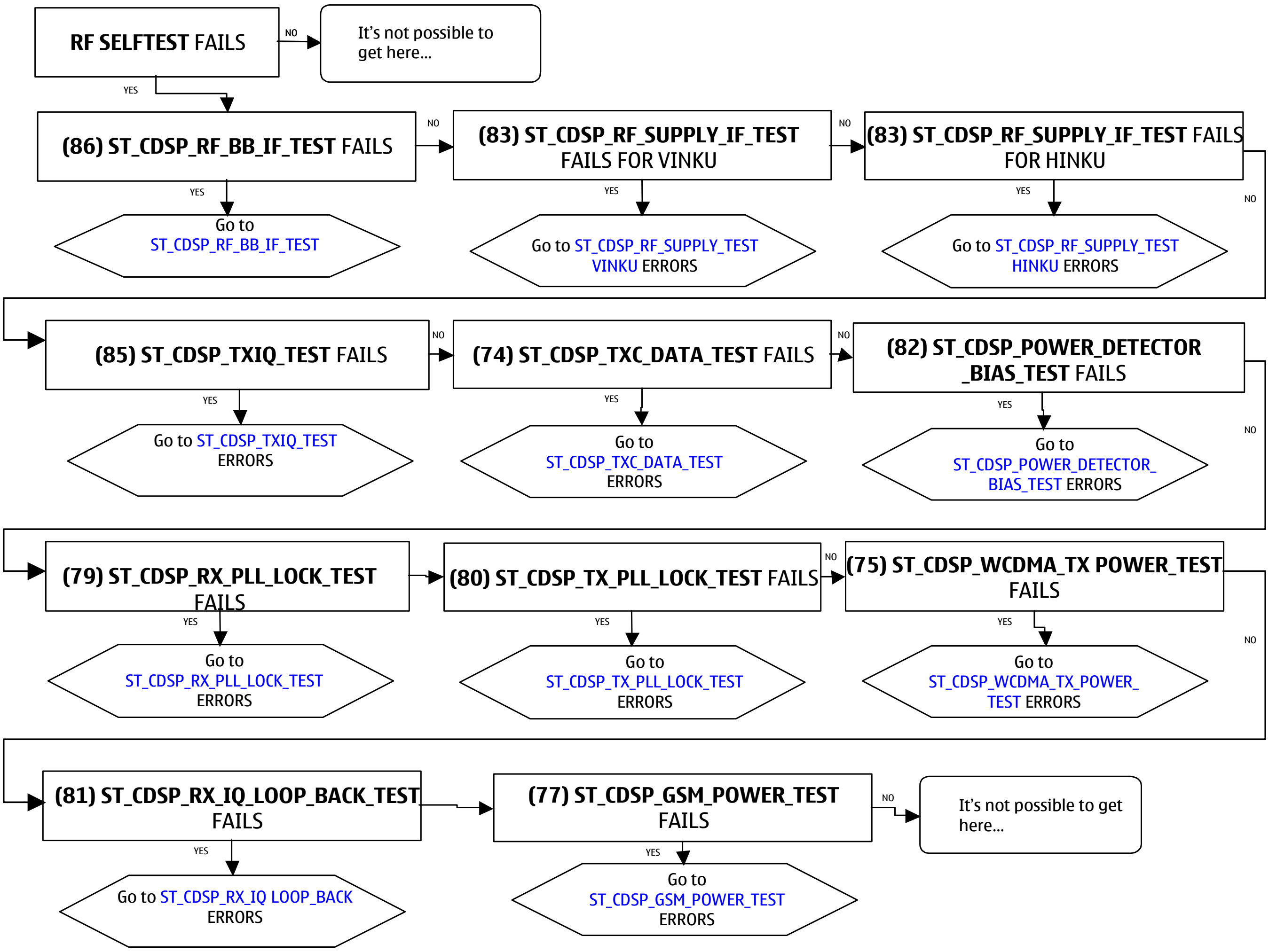
perating mode: Local

	Test Name	Startup Test	Result	Detailed
☐	ST_CURRENT_CONS_TEST	Yes	Not executed [3]	
☐	ST_EAR_DATA_LOOP_TEST	Yes	Passed [0]	
☐	ST_KEYBOARD_STUCK_TEST	No	Not executed [3]	
☐	ST_SIM_CLK_LOOP_TEST	Yes	Passed [0]	
☐	ST_SIM_IO_CTRL_LOOP_TEST	Yes	Passed [0]	
☐	ST_BACKUP_BATT_TEST	Yes	Passed [0]	
☐	ST_LPRF_IF_TEST	No	Not executed [3]	
☐	ST_CAMERA_IF_TEST	No	Not executed [3]	
☐	ST_SIM_LOCK_TEST	Yes	Not executed [3]	
☐	ST_LPRF_AUDIO_LINES_TEST	No	Not executed [3]	
☐	ST_UEM_CBUS_IF_TEST	Yes	Passed [0]	
☐	ST_SLEEPCLK_FREQ_TEST	Yes	Passed [0]	
☐	ST_CMT_APE_WAKEUP_TEST	Yes	Not executed [3]	
☐	ST_MAIN_LCD_IF_TEST	No	Not executed [3]	
☐	ST_BT_WAKEUP_TEST	No	Not executed [3]	
☑	ST_CDSP_TXC_DATA_TEST	No	Passed [0]	0x00,0x00
☑	ST_CDSP_WCDMA_TX_POWER_TEST	No	Passed [0]	0x00,0x00,0x01,0xE9
☑	ST_CDSP_GSM_TX_POWER_TEST	No	Passed [0]	0x00,0x00
☑	ST_CDSP_RX_PLL_PHASE_LOCK_TEST	No	Passed [0]	0x00,0x00,0x00,0x00
☑	ST_CDSP_TX_PLL_PHASE_LOCK_TEST	No	Passed [0]	0x00,0x00,0x00,0x00
☑	ST_CDSP_RX_IQ_LOOP_BACK_TEST	No	Passed [0]	0x00,0x00,0x74,0x9E
☑	ST_CDSP_PWR_DETECTOR_BIAS_TEST	No	Passed [0]	0x00,0x00,0x00,0x40
☑	ST_CDSP_RF_SUPPLY_TEST	No	Passed [0]	0x00
☑	ST_CDSP_TX_IQ_TEST	No	Passed [0]	0x00,0x00,0x03
☑	ST_CDSP_RF_BB_IF_TEST	No	Passed [0]	0x00,0x00,0x00,0x00
☐	ST_TAHVOINT_TEST	Yes	Passed [0]	
☐	ST_PWR_KEY_TEST	Yes	Not executed [3]	
☐	ST_SECURITY_TEST	Yes	Not executed [3]	
☐	ST_HOOKINT_TEST	No	Not executed [3]	

If one or more self tests show fail results (for example: “minor” or “fatal”) more detailed error codes can be read from the phone with “Details” button. Error codes are shown in hexadecimal format, but notice that all returned hexadecimal values are not necessarily useful in RF troubleshooting because some of the self tests return also different kind of measurement information together with “real” error codes. If self tests are not passed, please refer to following subchapters for detailed troubleshooting information.

IMPORTANT!

In order to use these self-tests most efficiently, it is very important that the tests are performed in certain order (or at least the error data is analyzed in this order). The tests are designed so that by performing them in this order it is easy to find the problematic component without any redundant checks. The following flowchart is based on that idea (i.e. if RFBUS fails, there is no need to spend time wondering why there is no power at TX).


RF SELFTEST FAILS
NO
It's not possible to get here...
YES
(86) ST_CDSP_RF_BB_IF_TEST FAILS
YES
Go to ST_CDSP_RF_BB_IF_TEST
NO
(83) ST_CDSP_RF_SUPPLY_IF_TEST FAILS FOR VINKU
YES
Go to ST_CDSP_RF_SUPPLY_TEST VINKU ERRORS
NO
(83) ST_CDSP_RF_SUPPLY_IF_TEST FAILS FOR HINKU
YES
Go to ST_CDSP_RF_SUPPLY_TEST HINKU ERRORS
NO
(85) ST_CDSP_TXIQ_TEST FAILS
YES
Go to ST_CDSP_TXIQ_TEST ERRORS
NO
(74) ST_CDSP_TXC_DATA_TEST FAILS
YES
Go to ST_CDSP_TXC_DATA_TEST ERRORS
NO
(82) ST_CDSP_POWER_DETECTOR _BIAS_TEST FAILS
YES
Go to ST_CDSP_POWER_DETECTOR_ BIAS_TEST ERRORS
NO
(79) ST_CDSP_RX_PLL_LOCK_TEST FAILS
YES
Go to ST_CDSP_RX_PLL_LOCK_TEST ERRORS
(80) ST_CDSP_TX_PLL_LOCK_TEST FAILS
YES
Go to ST_CDSP_TX_PLL_LOCK_TEST ERRORS
NO
(75) ST_CDSP_WCDMA_TX POWER_TEST FAILS
YES
Go to ST_CDSP_WCDMA_TX_POWER_ TEST ERRORS
NO
(81) ST_CDSP_RX_IQ_LOOP_BACK_TEST FAILS
YES
Go to ST_CDSP_RX_IQ LOOP_BACK ERRORS
(77) ST_CDSP_GSM_POWER_TEST FAILS
YES
Go to ST_CDSP_GSM_POWER_TEST ERRORS
NO
It's not possible to get here...

2.1 RF-BB interface (ST_CDSP_RF_BB_IF_TEST)

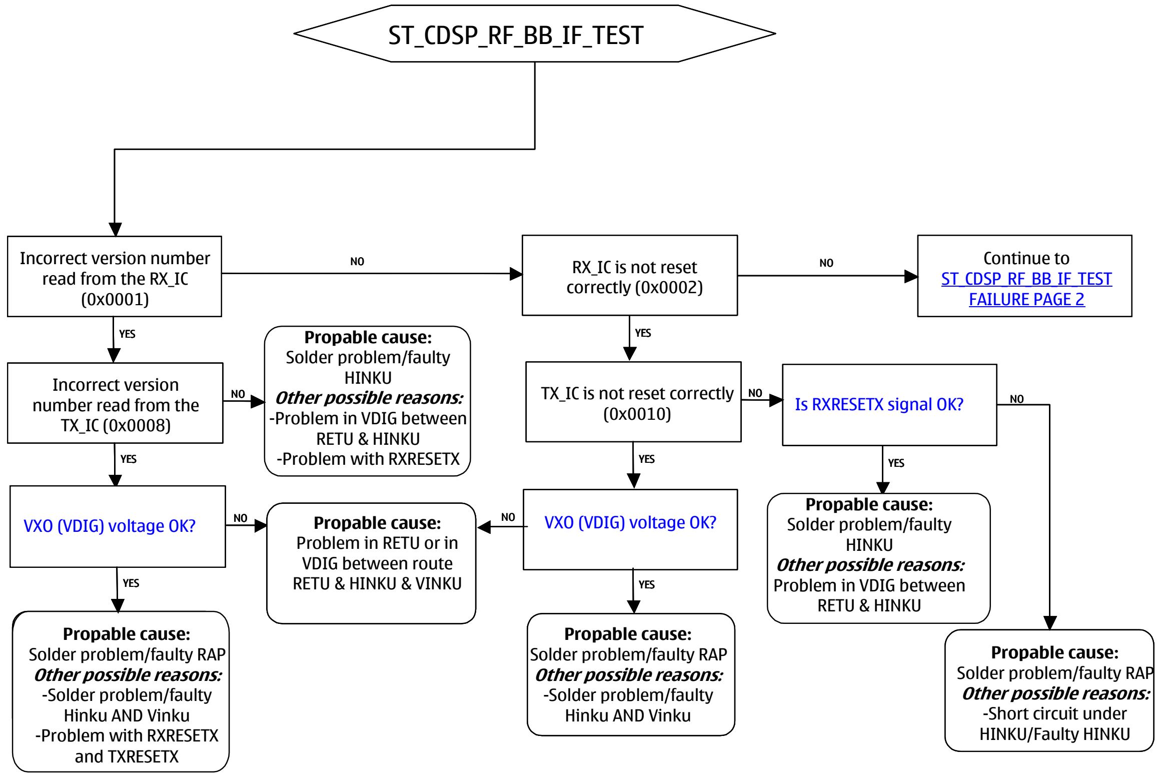
RF_BB_IF test (86) tests the functionality of the RAP3G/HINKU/VINKU serial interface & reset lines. If this test fails, it means that there's a problem programming Hinku and or Vinku and all of the following tests cannot give correct data.

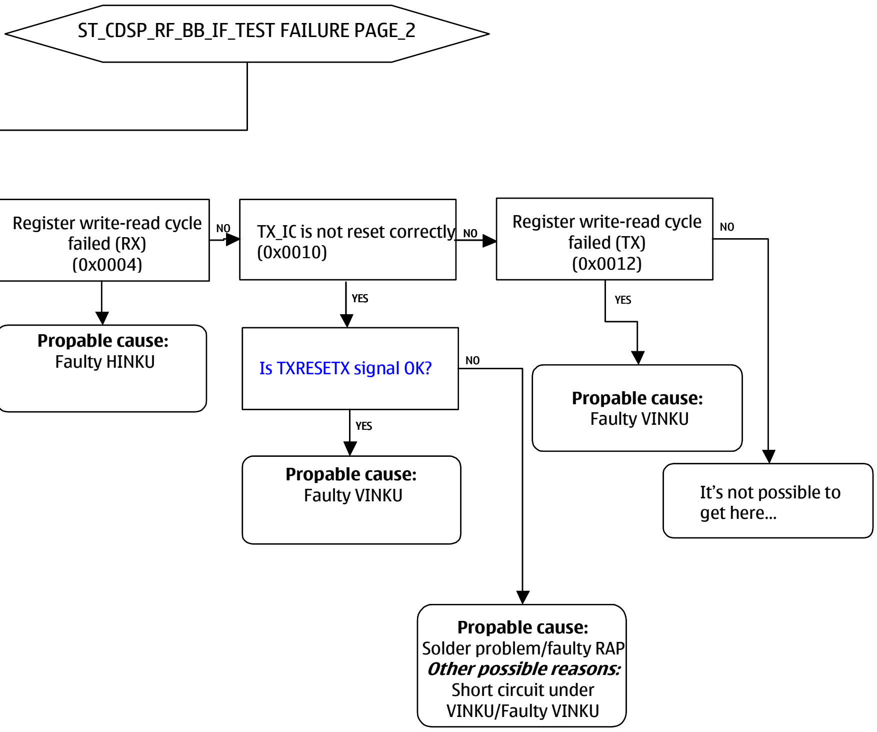
Tested signals: VBAT_ASIC, VDIG, VREFRF01, VXO, RFBUSDAT, RFBUSCLK, RFBUSENA, RXRESETX, TXRESETX

Error code for this self test is given in format:

- *0xyy, 0xzz*

,where 0xyy, 0xzz part is the total error code: 0xyyzz


ST_CDSP_RF_BB_IF_TEST
Incorrect version number read from the RX_IC (0x0001)
NO
RX_IC is not reset correctly (0x0002)
NO
Continue to ST_CDSP_RF_BB_IF_TEST FAILURE PAGE 2
YES
Incorrect version number read from the TX_IC (0x0008)
NO
Propable cause: Solder problem/faulty HINKU Other possible reasons: -Problem in VDIG between RETU & HINKU -Problem with RXRESETX
YES
TX_IC is not reset correctly (0x0010)
NO
Is RXRESETX signal OK?
NO
YES
VXO (VDIG) voltage OK?
NO
Propable cause: Problem in RETU or in VDIG between route RETU & HINKU & VINKU
NO
YES
VXO (VDIG) voltage OK?
YES
Propable cause: Solder problem/faulty HINKU Other possible reasons: Problem in VDIG between RETU & HINKU
YES
Propable cause: Solder problem/faulty RAP Other possible reasons: -Solder problem/faulty Hinku AND Vinku -Problem with RXRESETX and TXRESETX
YES
Propable cause: Solder problem/faulty RAP Other possible reasons: -Solder problem/faulty Hinku AND Vinku
Propable cause: Solder problem/faulty RAP Other possible reasons: -Short circuit under HINKU/Faulty HINKU


ST_CDSP_RF_BB_IF_TEST FAILURE PAGE_2
Incorrect version number read from the TX_IC (0x0008)
NO
Register write-read cycle failed (RX) (0x0004)
NO
TX_IC is not reset correctly (0x0010)
NO
Register write-read cycle failed (TX) (0x0012)
NO
YES
Propable cause: Poor solder/faulty Vinku Other possible reasons: VDIG connection between RETU & VINKU
Propable cause: Faulty HINKU
YES
Is TXRESETX signal OK?
NO
YES
Propable cause: Faulty VINKU
YES
Propable cause: Faulty VINKU
It's not possible to get here...
Propable cause: Solder problem/faulty RAP Other possible reasons: Short circuit under VINKU/Faulty VINKU

Please, refer to chapter Error Code Interpretation Examples if more information about error code interpretation is needed.

2.2 Supply test for Hinku and Vinku (ST_CDSP_RF_SUPPLY_TEST)

This self test includes two different RF-supply self tests...one for Vinku and one for Hinku:

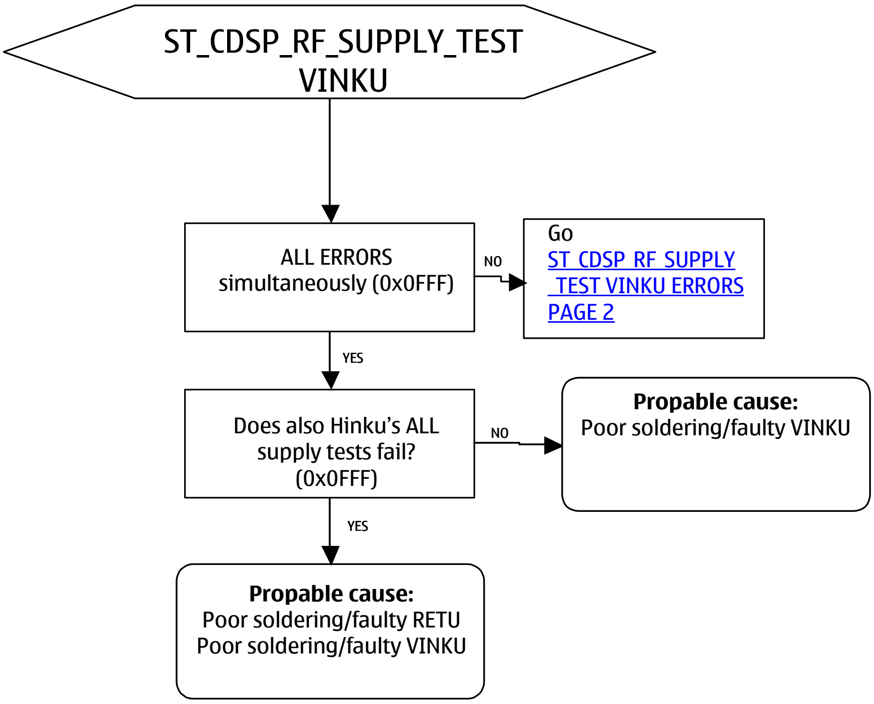
RF_SUPPLY_TEST (VINKU) (83) tests the functionality of Vinku's bias block, regulators, reference voltage line and, supply connections.
If these fail, all other Vinku tests can/will fail. Also many Hinku tests can be affected and can't be trusted.

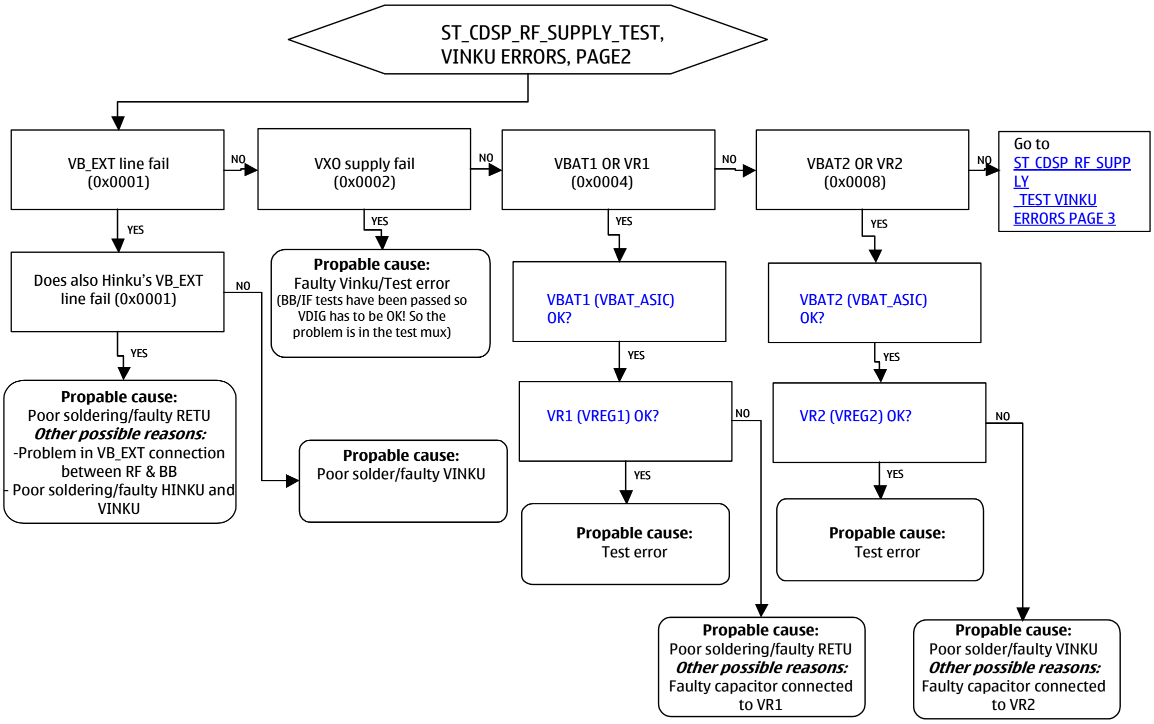
RF_SUPPLY_TEST (HINKU) (83) tests the functionality of Hinku's bias block, regulators, reference voltage line and, supply connections.
If these fail, all other Hinku tests can/will fail and can't be trusted.
Error code for this self test is given in format:

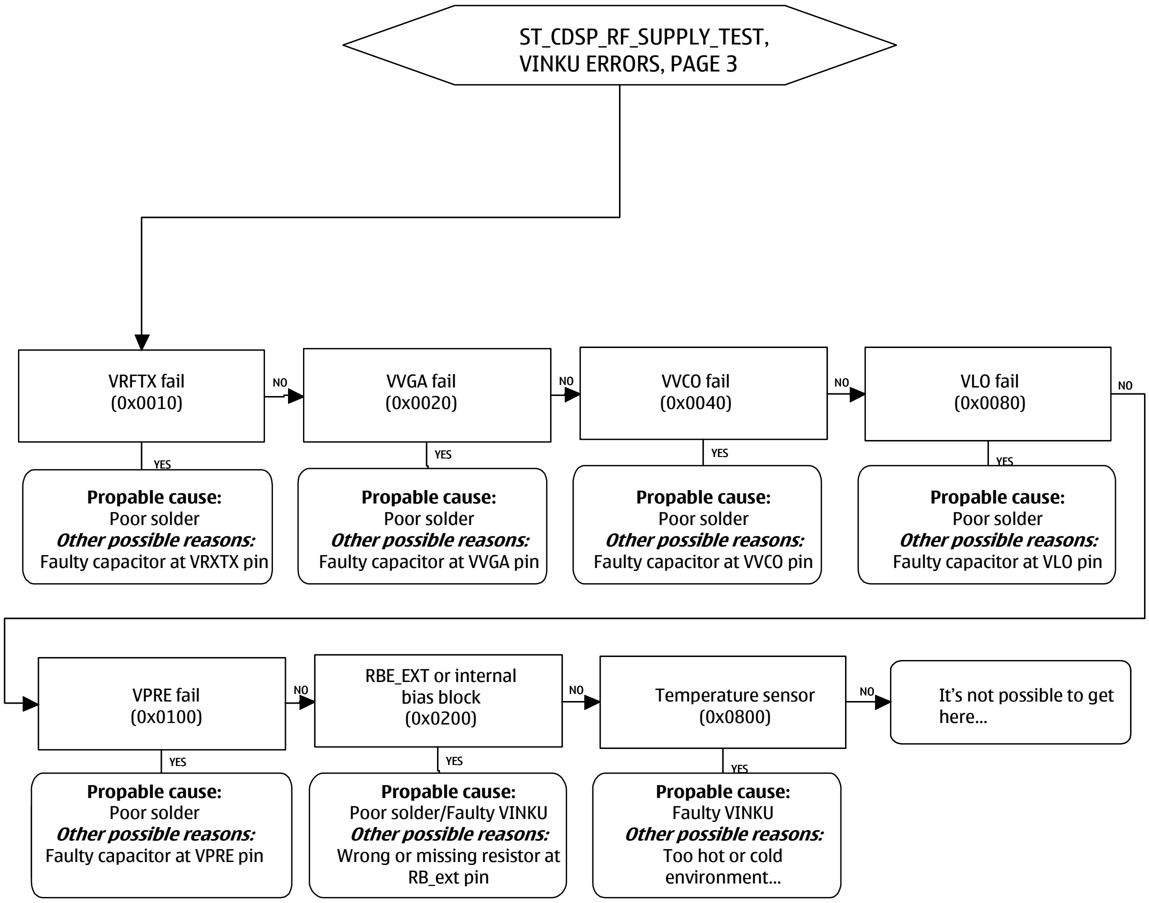
- *0xyy, 0xyy, 0xzz, 0xzz, MeasResult1, MeasResult2, ...*

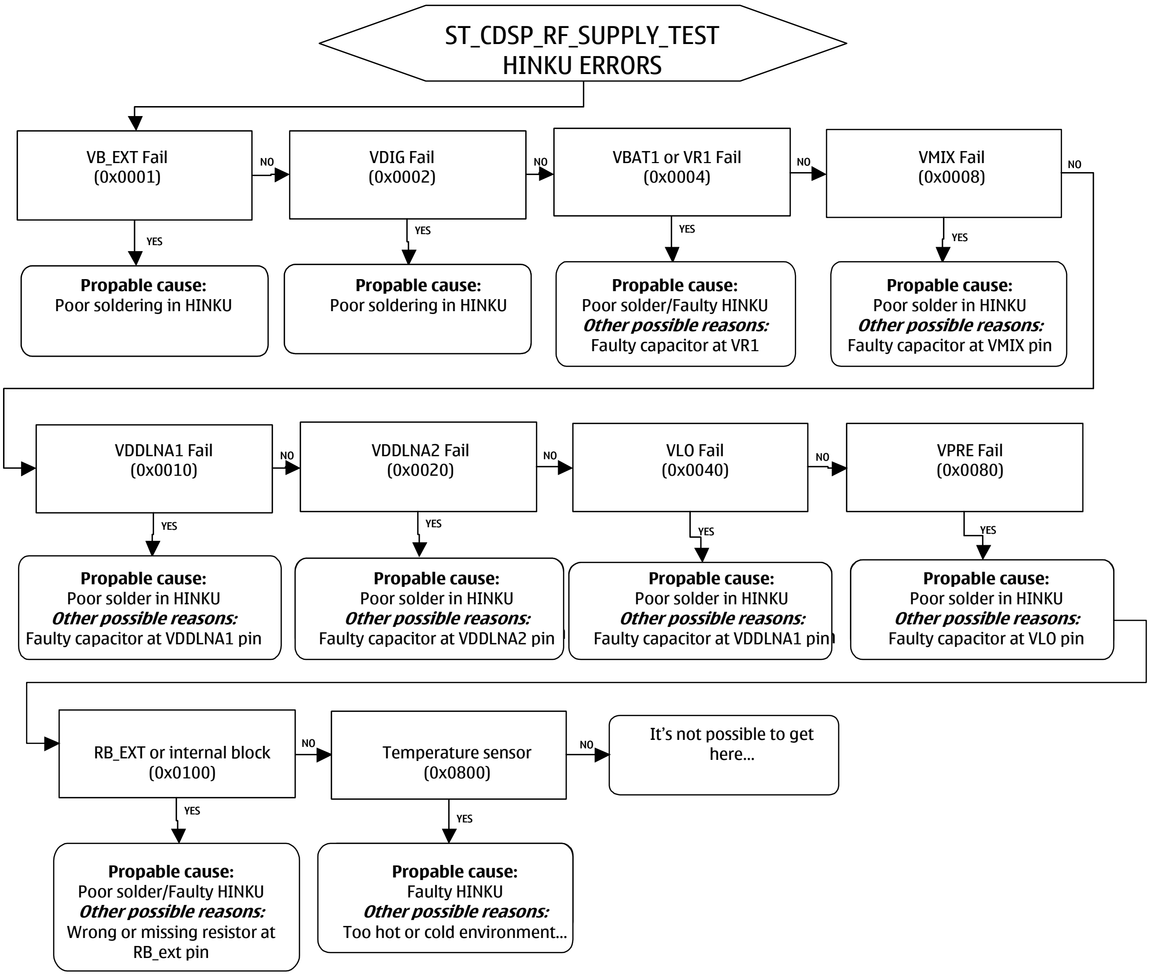
,where 0xyy, 0xyy part is the main part of the error code for Vinku TX ASIC: 0xyyyy

and 0xzz, 0xzz is the main part of the error code for Hinku TX ASIC: 0xzzzz


ST_CDSP_RF_SUPPLY_TEST
VINKU
ALL ERRORS
simultaneously (0x0FFF)
NO
Go
ST_CDSP_RF_SUPPLY
_TEST VINKU ERRORS
PAGE 2
YES
Does also Hinku's ALL
supply tests fail?
(0x0FFF)
NO
Propable cause:
Poor soldering/faulty VINKU
YES
Propable cause:
Poor soldering/faulty RETU
Poor soldering/faulty VINKU


ST_CDSP_RF_SUPPLY_TEST,
VINKU ERRORS, PAGE2
VB_EXT line fail (0x0001)
NO
VXO supply fail (0x0002)
NO
VBAT1 OR VR1 (0x0004)
NO
VBAT2 OR VR2 (0x0008)
NO
Go to ST_CDSP_RF_SUPPLY_TEST VINKU ERRORS PAGE 3
YES
Does also Hinku's VB_EXT line fail (0x0001)
NO
YES
Propable cause: Faulty Vinku/Test error (BB/IF tests have been passed so VDIG has to be OK! So the problem is in the test mux)
YES
VBAT1 (VBAT_ASIC) OK?
YES
VBAT2 (VBAT_ASIC) OK?
YES
Propable cause: Poor soldering/faulty RETU
Other possible reasons:
-Problem in VB_EXT connection between RF & BB
- Poor soldering/faulty HINKU and VINKU
Propable cause: Poor solder/faulty VINKU
YES
VR1 (VREG1) OK?
NO
YES
VR2 (VREG2) OK?
NO
YES
Propable cause: Test error
Propable cause: Test error
Propable cause: Poor soldering/faulty RETU
Other possible reasons: Faulty capacitor connected to VR1
Propable cause: Poor solder/faulty VINKU
Other possible reasons: Faulty capacitor connected to VR2


ST_CDSP_RF_SUPPLY_TEST, VINKU ERRORS, PAGE 3
VRFTX fail (0x0010)
NO
VVGA fail (0x0020)
NO
VVCO fail (0x0040)
NO
VLO fail (0x0080)
NO
YES
Propable cause: Poor solder Other possible reasons: Faulty capacitor at VRXTX pin
YES
Propable cause: Poor solder Other possible reasons: Faulty capacitor at VVGA pin
YES
Propable cause: Poor solder Other possible reasons: Faulty capacitor at VVCO pin
YES
Propable cause: Poor solder Other possible reasons: Faulty capacitor at VLO pin
VPRE fail (0x0100)
NO
RBE_EXT or internal bias block (0x0200)
NO
Temperature sensor (0x0800)
NO
It's not possible to get here...
YES
Propable cause: Poor solder Other possible reasons: Faulty capacitor at VPRE pin
YES
Propable cause: Poor solder/Faulty VINKU Other possible reasons: Wrong or missing resistor at RB_ext pin
YES
Propable cause: Faulty VINKU Other possible reasons: Too hot or cold environment...


ST_CDSP_RF_SUPPLY_TEST
HINKU ERRORS
VB_EXT Fail (0x0001)
NO
YES
Propable cause: Poor soldering in HINKU
VDIG Fail (0x0002)
NO
YES
Propable cause: Poor soldering in HINKU
VBAT1 or VR1 Fail (0x0004)
NO
YES
Propable cause: Poor solder/Faulty HINKU Other possible reasons: Faulty capacitor at VR1
VMIX Fail (0x0008)
NO
YES
Propable cause: Poor solder in HINKU Other possible reasons: Faulty capacitor at VMIX pin
VDDLNA1 Fail (0x0010)
NO
YES
Propable cause: Poor solder in HINKU Other possible reasons: Faulty capacitor at VDDLNA1 pin
VDDLNA2 Fail (0x0020)
NO
YES
Propable cause: Poor solder in HINKU Other possible reasons: Faulty capacitor at VDDLNA2 pin
VLO Fail (0x0040)
NO
YES
Propable cause: Poor solder in HINKU Other possible reasons: Faulty capacitor at VDDLNA1 pin
VPRE Fail (0x0080)
YES
Propable cause: Poor solder in HINKU Other possible reasons: Faulty capacitor at VLO pin
RB_EXT or internal block (0x0100)
NO
YES
Propable cause: Poor solder/Faulty HINKU Other possible reasons: Wrong or missing resistor at RB_ext pin
Temperature sensor (0x0800)
NO
YES
Propable cause: Faulty HINKU Other possible reasons: Too hot or cold environment...
It's not possible to get here...

Please, refer to chapter Error Code Interpretation Examples if more information about error code interpretation is needed.

2.3 TX IQ self test (ST_CDSP_TX_IQ_TEST)

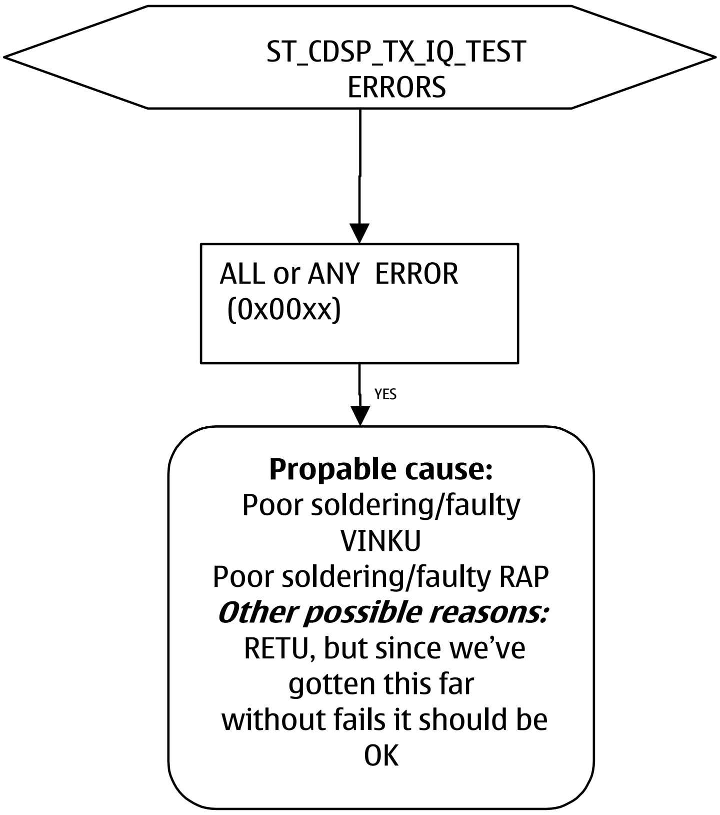
TX_IQ_TEST (85) checks that the TXIQ lines between RAP & Vinku are properly connected. If this fails also power tests and RXIQ loopback will fail.

Tested signals: VBAT_ASIC, TXIP, TXIQ, TXQP, TXQN, DAC_REF1, RFBUS

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2, …*

,where 0xyy, 0xzz is the main part of the error code: 0xyyzz


ST_CDSP_TX_IQ_TEST
ERRORS
ALL or ANY ERROR
(0x00xx)
YES
Propable cause:
Poor soldering/faulty
VINKU
Poor soldering/faulty RAP
Other possible reasons:
RETU, but since we've
gotten this far
without fails it should be
OK

2.4 TXC Data test (ST_TXC_DATA_TEST)

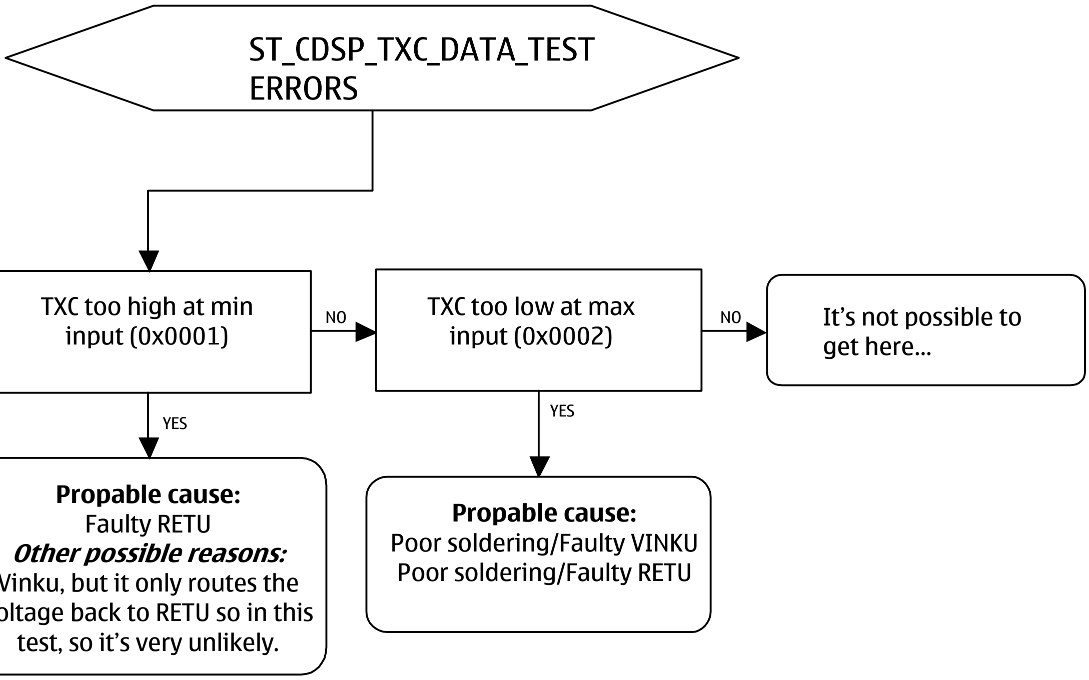
TXC_DATA_TEST (74) tests that the TXC line between RETU & VINKU is properly connected. If this fails also TX power tests will fail.

Test covers: TxC power control signal, Retu (N2200), RFBUS, Vinku (N7501), VBAT_ASIC

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2, ...*

,where 0xyy, 0xzz part is the main part of the error code: 0xyyzz


ST_CDSP_TXC_DATA_TEST
ERRORS
TXC too high at min input (0x0001)
NO
TXC too low at max input (0x0002)
NO
It's not possible to get here...
YES
Propable cause:
Faulty RETU
Other possible reasons:
Vinku, but it only routes the voltage back to RETU so in this test, so it's very unlikely.
YES
Propable cause:
Poor soldering/Faulty VINKU
Poor soldering/Faulty RETU

2.5 WCDMA power detector biasing self test (ST_CDSP_PWR_DETECTOR_BIAS_TEST)

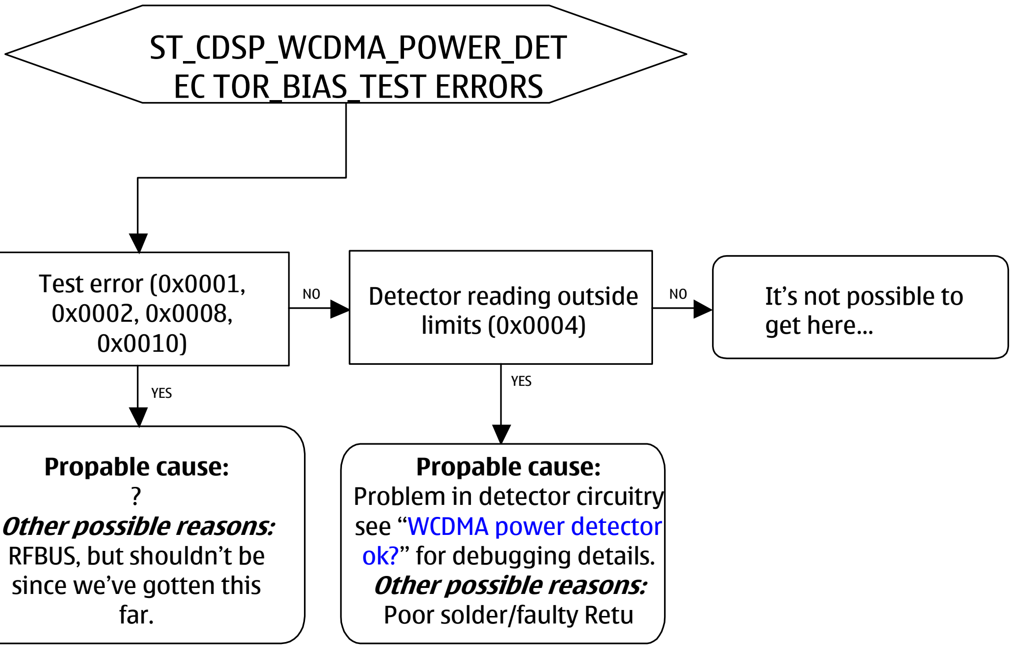
POWER_DETECTOR_BIAS_TEST (82) tests the biasing of the power detector.
If this fails, also the power tests will fail/can’t be trusted.

Test covers: Vinku (N7501) WCDMA power detector biasing circuit functionality, Retu (N2200) WTXDET input. RFBUS, VBAT_ASIC

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2*

,where 0xyy, 0xzz part is the main part of the error code: 0xyyzz


ST_CDSP_WCDMA_POWER_DET EC TOR_BIAS_TEST ERRORS
Test error (0x0001, 0x0002, 0x0008, 0x0010)
NO
Detector reading outside limits (0x0004)
NO
It’s not possible to get here...
YES
YES
Propable cause: ? Other possible reasons: RFBUS, but shouldn’t be since we’ve gotten this far.
Propable cause: Problem in detector circuitry see “WCDMA power detector ok?” for debugging details. Other possible reasons: Poor solder/faulty Retu

Please, refer to chapter Error Code Interpretation Examples if more information about error code interpretation is needed.

2.5.1 WCDMA power detector ok?

Follow these instructions if it’s needed to check WCDMA power detector functionality. Please notice that WCDMA power detector is used only in maximum TX power limiting and WCDMA PA supply voltage controlling purposes.

- WCDMA transmitter has to be active before measurements. Procedure is explained in chapter “Transmitter troubleshooting”.

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7531.
- WTXDET signal should be constant DC-voltage. Voltage level should change if TX power is changed. Vcontrol is lower on lower power levels and higher if higher power levels are used.
- WTXDET should be about 325 mV with power level +10 dBm, about 1.03 V with power level +21 dBm and about 150 mV when power levels below 0 dBm are used.
- **NOTICE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.**
- If WTXDET –signal is not as expected follow the same troubleshooting instructions as in: Does SMPS get correct control voltage from the WCDMA power detector (signal Vcontrol)?

2.6 RX PLL phase lock self test (ST_CDSP_RX_PLL_PHASE_LOCK_TEST)

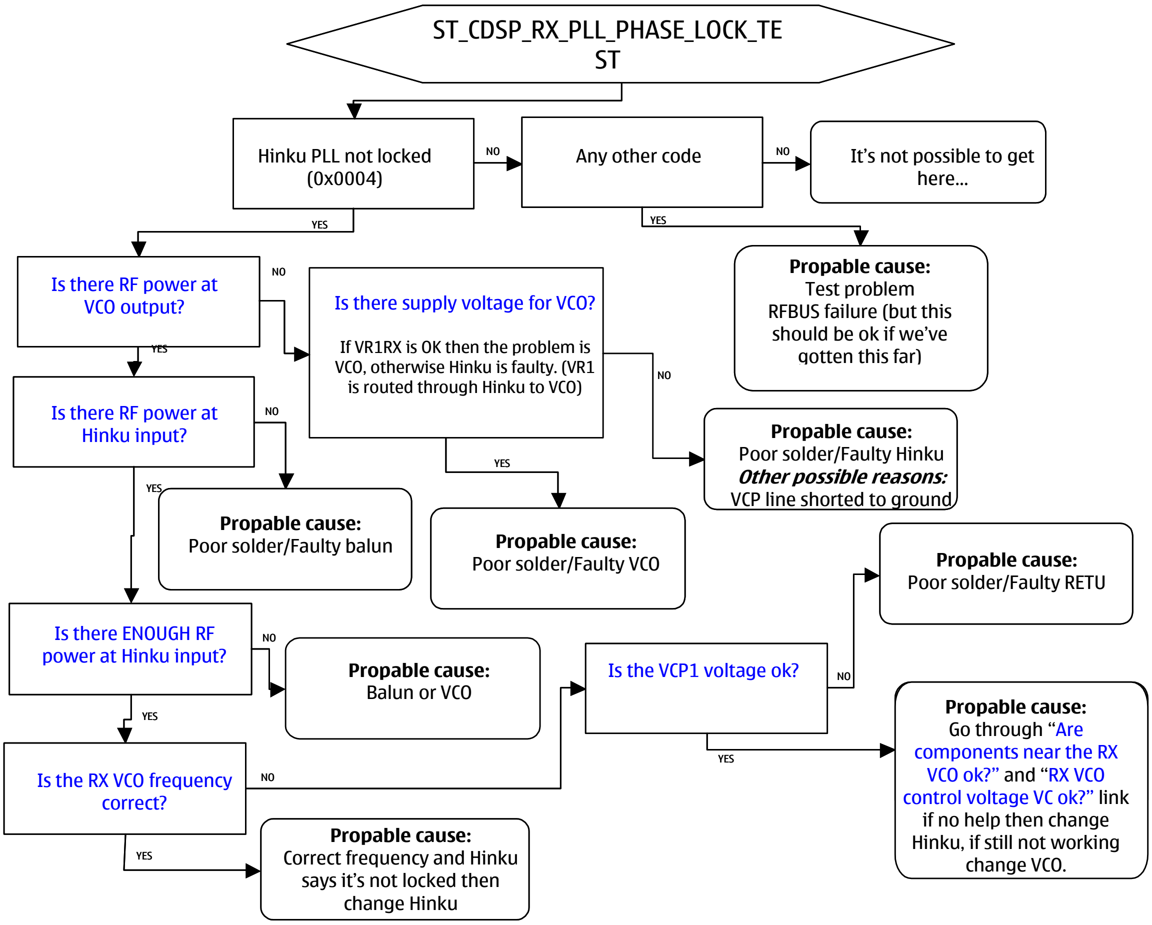
RX_PLL_LOCK_TEST (79) tests the functionality of RX PLL. If this fails, none of the RX related measurements cannot be trusted.

Tested signals: VBAT_ASIC, VDIG, VR1, VR1RX, VCP1, RFBUSDAT, RFBUSCLK, RFBUSENA, RXRESETX

Error code for this self test is given in format:

- *0xyy, 0xzz*

,where 0xyy, 0xzz part is the total error code: 0xyyzz


ST_CDSP_RX_PLL_PHASE_LOCK_TEST
Hinku PLL not locked (0x0004)
NO
Any other code
NO
It's not possible to get here...
YES
YES
Propable cause: Test problem RFBUS failure (but this should be ok if we've gotten this far)
Is there RF power at VCO output?
NO
Is there supply voltage for VCO?
If VR1RX is OK then the problem is VCO, otherwise Hinku is faulty. (VR1 is routed through Hinku to VCO)
YES
NO
Is there RF power at Hinku input?
NO
Propable cause: Poor solder/Faulty Hinku
Other possible reasons: VCP line shorted to ground
YES
YES
Propable cause: Poor solder/Faulty balun
Propable cause: Poor solder/Faulty VCO
Propable cause: Poor solder/Faulty RETU
Is there ENOUGH RF power at Hinku input?
NO
Propable cause: Balun or VCO
Is the VCP1 voltage ok?
NO
YES
YES
Propable cause: Go through "Are components near the RX VCO ok?" and "RX VCO control voltage VC ok?" link if no help then change Hinku, if still not working change VCO.
Is the RX VCO frequency correct?
NO
YES
Propable cause: Correct frequency and Hinku says it's not locked then change Hinku

2.7 TX PLL phase lock self test (ST_CDSP_TX_PLL_PHASE_LOCK_TEST)

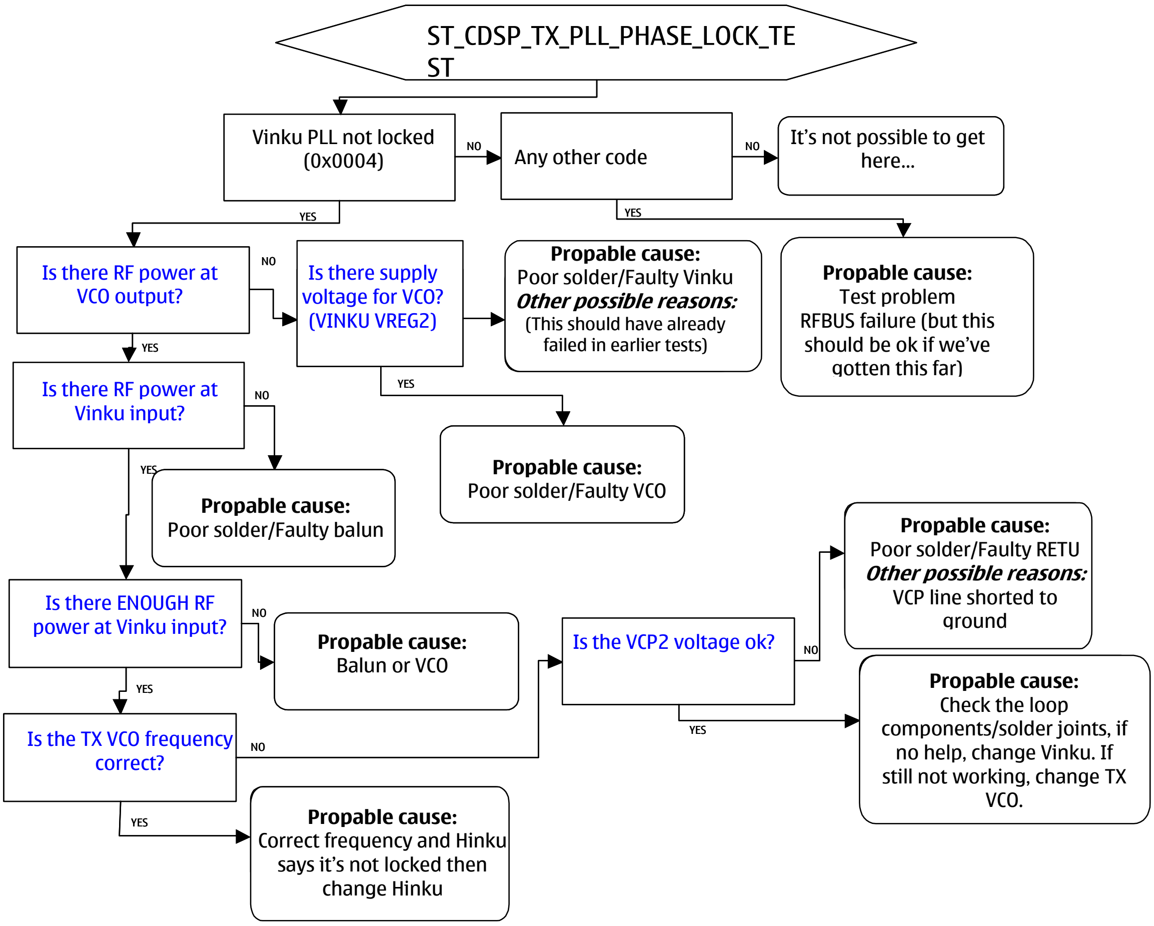
TX_PLL_LOCK_TEST (80) tests the functionality of RX PLL. If this fails also the TX power tests will fail.

Tested signals: VBAT_ASIC, VDIG, VR1, VCP2, RFBUSDAT, RFBUSCLK, RFBUSENA, TXRESETX

Error code for this self test is given in format:

- *0xyy, 0xzz*

,where 0xyy, 0xzz part is the total error code: 0xyyzz


ST_CDSP_TX_PLL_PHASE_LOCK_TEST
Vinku PLL not locked (0x0004)
NO
Any other code
NO
It's not possible to get here...
YES
YES
Is there RF power at VCO output?
NO
Is there supply voltage for VCO? (VINKU VREG2)
Propable cause: Poor solder/Faulty Vinku Other possible reasons: (This should have already failed in earlier tests)
Propable cause: Test problem RFBUS failure (but this should be ok if we've gotten this far)
YES
YES
Is there RF power at Vinku input?
NO
Propable cause: Poor solder/Faulty VCO
YES
Propable cause: Poor solder/Faulty balun
Propable cause: Poor solder/Faulty RETU Other possible reasons: VCP line shorted to ground
Is there ENOUGH RF power at Vinku input?
NO
Propable cause: Balun or VCO
Is the VCP2 voltage ok?
NO
YES
Propable cause: Check the loop components/solder joints, if no help, change Vinku. If still not working, change TX VCO.
YES
Is the TX VCO frequency correct?
NO
YES
Propable cause: Correct frequency and Hinku says it's not locked then change Hinku

2.8 WCDMA transmitter self test (ST_CDSP_WCDMA_TX_POWER_TEST)

TX_WCDMA_POWER_TEST (75) checks the output power of the WCDMA transmitter.

Test covers: Modulator, Vinku (N7501) IC gain stages, IC output supply components, TX filter, WCDMA PA (N7503), DCDC-converter (N7504), RFBUS, VBAT_ASIC, VBAT_PA

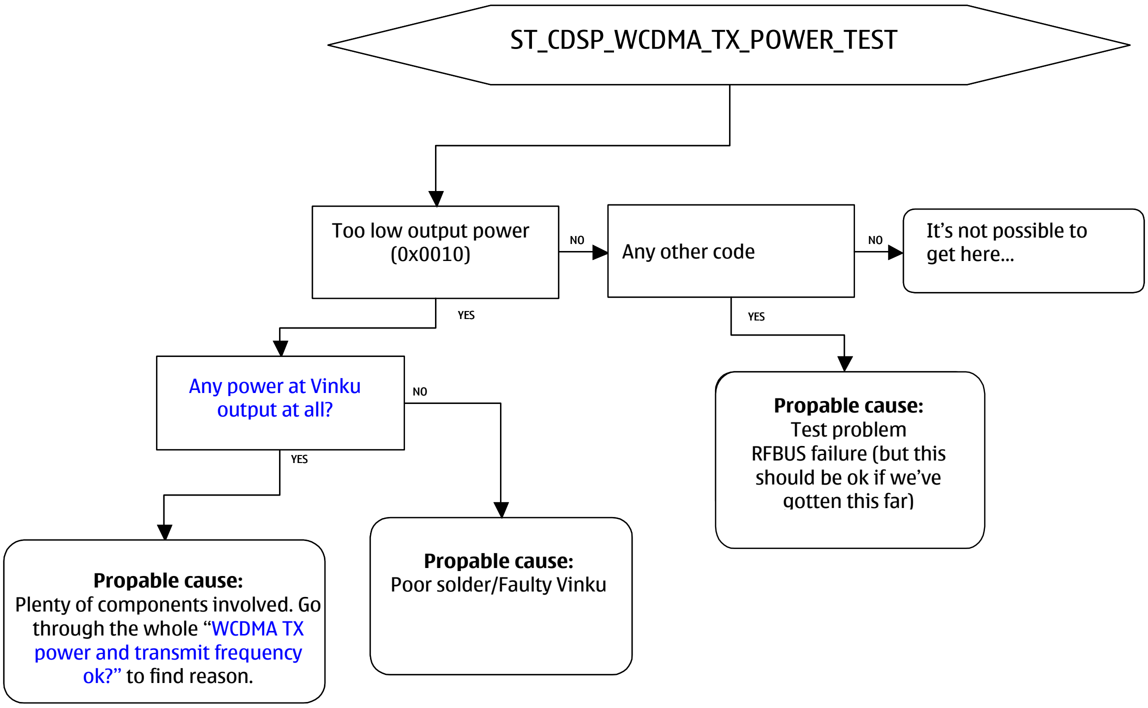
Test does not cover: Circulator (Z7505), duplexer (Z7502), and antenna

To prevent network interference, the phone must be in an RF shield box, when this test is run!

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2*

,where 0xyy, 0xzz part is the main part of the error code: 0xyyzz


ST_CDSP_WCDMA_TX_POWER_TEST
Too low output power (0x0010)
NO
Any other code
NO
It's not possible to get here...
YES
YES
Any power at Vinku output at all?
NO
YES
Propable cause: Test problem RFBUS failure (but this should be ok if we've gotten this far)
Propable cause: Plenty of components involved. Go through the whole "WCDMA TX power and transmit frequency ok?" to find reason.
Propable cause: Poor solder/Faulty Vinku

2.9 RX IQ loop back self test (ST_CDSP_RX_IQ_LOOP_BACK_TEST)

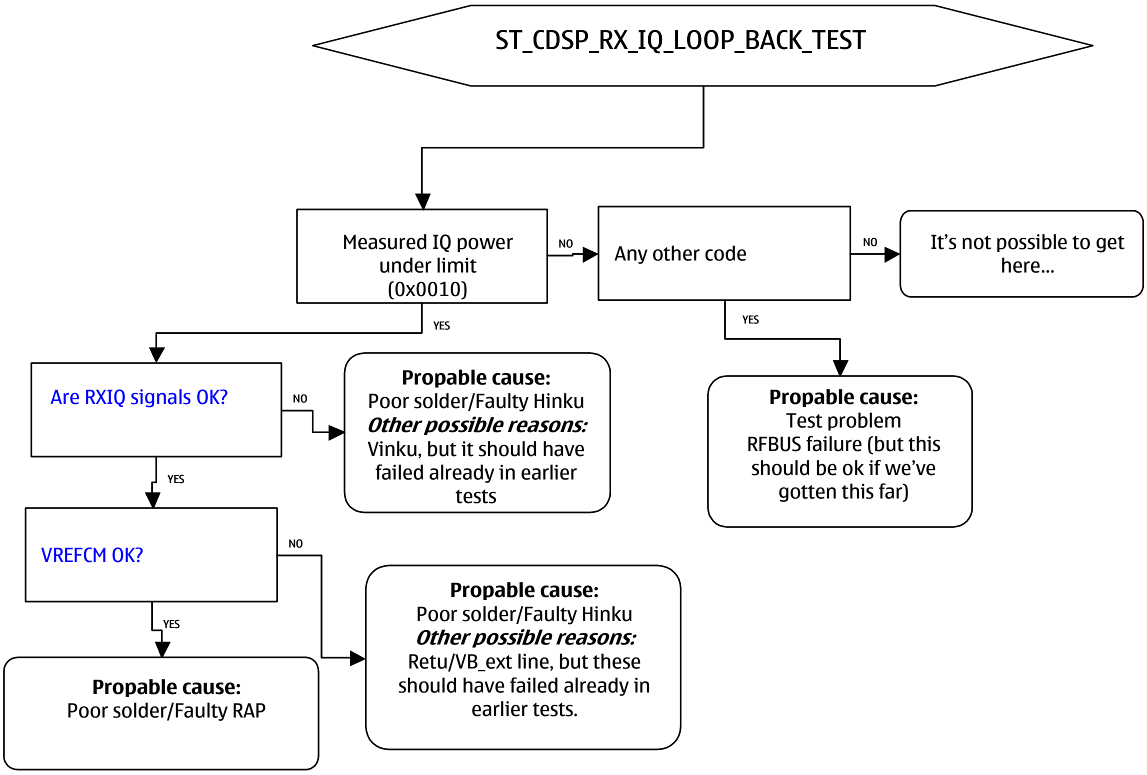
RX_IQ_LOOPBACK (81) tests that the RXI lines & VREFCM line between RAP & HINKU are connected.

Tested signals: VBAT_ASIC, RXQP, RXQN, RXIP, RXIN, VREFCM, TXIP, TXIN, RFBUS

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2*

,where 0xyy, 0xzz part is the main part of the error code: 0xyyzz


ST_CDSP_RX_IQ_LOOP_BACK_TEST
Measured IQ power under limit (0x0010)
NO
Any other code
NO
It's not possible to get here...
YES
YES
Are RXIQ signals OK?
NO
Propable cause:
Poor solder/Faulty Hinku
Other possible reasons:
Vinku, but it should have failed already in earlier tests
Propable cause:
Test problem
RFBUS failure (but this should be ok if we've gotten this far)
YES
VREFCM OK?
NO
Propable cause:
Poor solder/Faulty Hinku
Other possible reasons:
Retu/VB_ext line, but these should have failed already in earlier tests.
YES
Propable cause:
Poor solder/Faulty RAP

2.10 GSM transmitter self test (ST_CDSP_GSM_TX_POWER_TEST)

TX_GSM_POWER_TEST (77) checks the output power of the GSM transmitter.

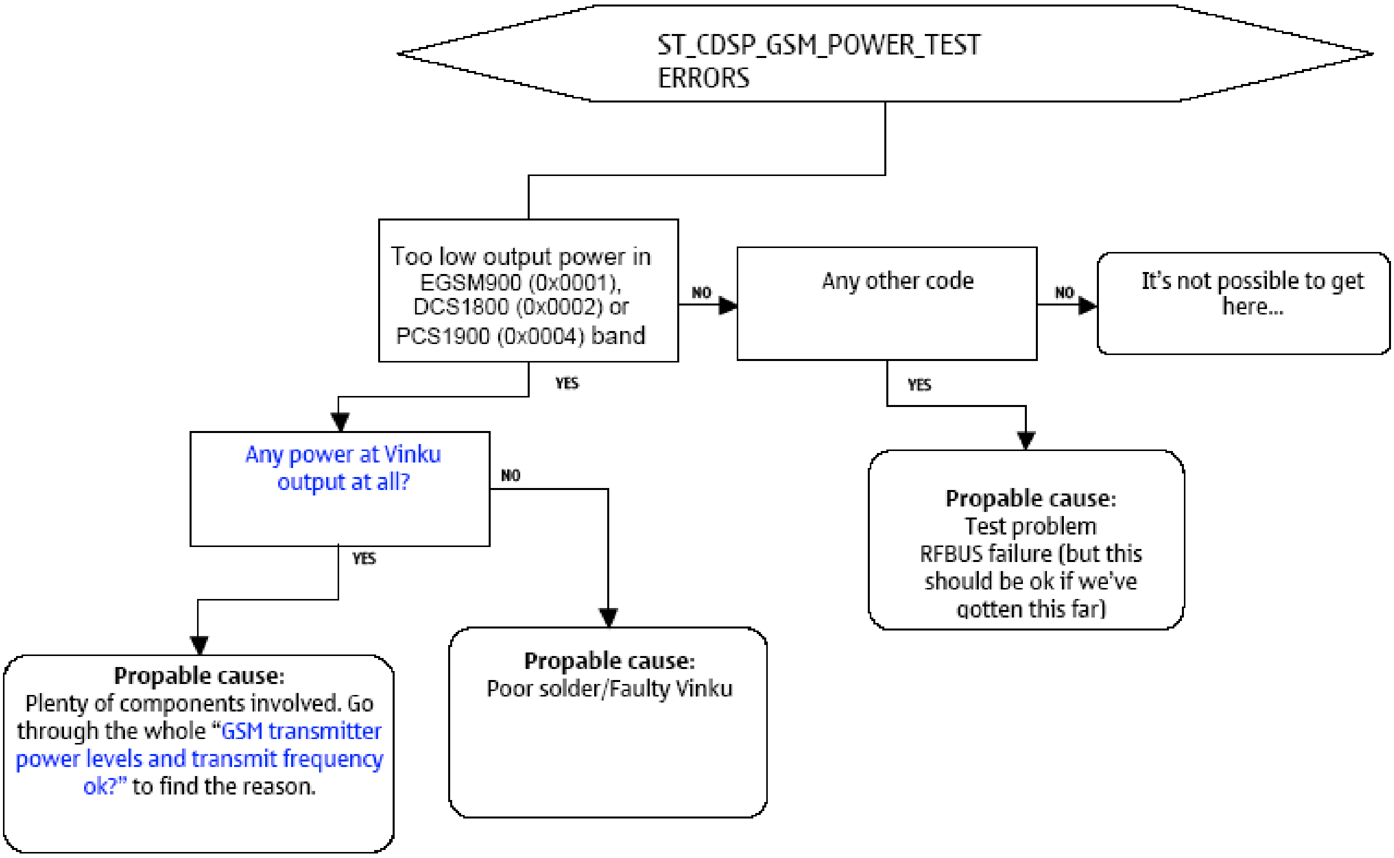
Test covers: RFIC Vinku (N7501), modulator, IC gain control stages, filter/balun solder joints, GSM PA (N7502), PA bias lines & DACs, RFBUS, TX power detector functionality, VBAT_ASIC, VBAT_PA.

Test does not cover: Antenna functionality, RX/TX-switch functionality, and TX signal quality

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2, …*

,where 0xyy, 0xzz part is the main part of the error code: 0xyyzz


ST_CDSP_GSM_POWER_TEST ERRORS
Too low output power in EGSM900 (0x0001), DCS1800 (0x0002) or PCS1900 (0x0004) band
NO
Any other code
NO
It's not possible to get here...
YES
YES
Any power at Vinku output at all?
NO
YES
Propable cause: Test problem RFBUS failure (but this should be ok if we've gotten this far)
Propable cause: Plenty of components involved. Go through the whole "GSM transmitter power levels and transmit frequency ok?" to find the reason.
Propable cause: Poor solder/Faulty Vinku

2.11 Error Code Interpretation Examples

This section presents three different examples of RF error code interpretation.

2.11.1 Example 1

ST_CDSP_RX_PLL_PHASE_LOCK self test gives "Fatal" result with error code: 0x00, 0x04

This means that the total error code is "0x004" ("0000 0000 0000 0100" in binary format) and if we look a flowchart in section RX PLL phase lock self test (ST_CDSP_RX_PLL_PHASE_LOCK_TEST) the meaning for the code is *"Hinku PLL is not locked"*.

2.11.2 Example 2

Some of the self-tests can return multiple errors at the same time.

For example: RF-BB interface (ST_CDSP_RF_BB_IF_TEST) self test gives "Fatal" result with error code: 0x00, 0x09, ...

This means that the total error code without measurement values is "0x0009" and this is the same as "0000 0000 0000 1001" in binary format. If we look closer there are multiple errors (2) found:

Bit mask "---- ---- ---- ---1" = "0x0001"

Bit mask "---- ---- ---- 1---" = "0x0008"

Troubleshooting can be continued with RF-BB interface (ST_CDSP_RF_BB_IF_TEST) flowchart because there are errors with two error codes: 0x0001 and 0x0008.

2.11.3 Example 3

Supply test for Hinku and Vinku (ST_CDSP_RF_SUPPLY_TEST) is slightly different self test from others because there are both Vinku and Hinku errors shown in the same error code (*The format for error code is explained in section Supply test for Hinku and Vinku).*

For example: ST_CDSP_RF_SUPPLY_TEST gives "Fatal" result with error code: 0x0B, 0xBC, 0x00, 0x00, ...

This error code means that there are probably no errors in Hinku RX ASIC supply voltages because the main part of the error code for Hinku is 0x00, 0x00 (=0x0000) and means the same as "no errors".

Anyway, there are many errors with Vinku TX ASIC supply voltages. The main part of the error code for Vinku is 0x0B, 0xBC and that's the same as "101110111100" in binary format. If we look closer there are multiple (8) errors found:

Bit mask "---- ---- ---- -1--" = "0x0004"

Bit mask "---- ---- ---- 1---" = "0x0008"

Bit mask "---- ---- ---1 ----" = "0x0010"

Bit mask "---- ---- --1- ----" = "0x0020"

Bit mask “---- ---- 1--- ----“ = ”0x0080”

Bit mask “---- ---1 ---- ----“ = “0x0100”

Bit mask “---- --1- ---- ----“ = ”0x0200”

Bit mask “---- 1--- ---- ----“ = ”0x0800”

Troubleshooting can be continued with ST_CDSP_RF_SUPPLY_TEST VINKU flowchart because there are errors with eight VINKU error codes.

Typically this kind of error occurs if there is no VBAT_ASIC voltage coming to the Vinku TX ASIC at all or the ASIC is poorly soldered to the PWB (All voltages that are somehow related to VBAT_ASIC are causing errors).

3. DOES THE PHONE REGISTER TO THE NETWORK AND MAKE A CALL (GSM)?

- Test against a GSM communication tester or real GSM network with a proper SIM.

3.1 GSM transmitter power levels and transmit frequency ok?

- Attach the phone to the product specific test jig and a spectrum analyser to the RF-coupler. Coupler attenuation should be also taken into account during measurements.
- Set GSM Tx ON. Procedure is explained in section “Transmitter troubleshooting”.
- Spectrum analyser centre frequency should be set according the used TX channel (See section “Frequency mappings”).
- Spectrum analyser RBW = VBW = 1 MHz, Span 0 MHz, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Test at least the maximum and minimum power levels:

- EGSM900: The maximum power level is “5” (31 – 34 dBm, typ. value +33 dBm)

  The minimum power level is “19” (3 – 7 dBm, typ. value +5 dBm)

- GSM1800: The maximum power level is “0” (28 – 32 dBm, typ. value +30 dBm)

  The minimum power level is “15” (-2 - +2 dBm, typ. value +0 dBm)

- GSM1900: The maximum power level is “0” (28 – 32 dBm, typ. value +30 dBm)

  The minimum power level is “15” (-2 - +2 dBm, typ. value +0 dBm)

- If power is not as expected separate the phone into parts and place to the module jig. Connect the spectrum analyser to the module jig GSM RF connector and measure power levels again (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).

- Power levels ok in the module jig: Antenna or antenna connection bad. Replace the antenna
- Power levels still wrong or no TX signal found at all: Continue troubleshooting

- If TX signal is not found at all use wider span setting and check if the transmitter is transmitting on wrong frequency. If the signal is found to be on wrong frequency or frequency is not stabile, see section 3.1.3. "GSM transmitter frequency correct".

3.1.1 Does GSM TX transmit RF-power at all?

- If TX signal is not found at all use wider span setting and check if the transmitter is transmitting on wrong frequency. If signal is found to be on wrong frequency or frequency is not stabile, see section, 3.1.3. "GSM transmitter frequency correct".

3.1.1.1 Is Vinku (N7501) transmitting RF-power at all?

- GSM transmitter has to be active before Vinku's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".

- Measurements can be done with a spectrum analyser and an RF probe. RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.

- EGSM900:

- Connect the RF probe to Z7504 input. The level should be about the same on both input pins. Check output level with at least the maximum (5) and the minimum (19) power levels.

- Maximum power level – Output level should be about -15...-25 dBm

- Minimum power level – Output level should be about -45...-55 dBm

- GSM1800/GSM1900:

- Connect the RF probe to C7577 or C7575. The level should be about the same on both capacitors. Check output level with at least the maximum (0) and the minimum (15) power levels.

- Maximum power level – Output level should be about -25...-35 dBm

- Minimum power level – Output level should be about -55...-65 dBm

- Check if output levels of Vinku are as expected.

- **NOTE! If VINKU output RF-power is totally missing just in one or two GSM-bands, typically this means that Vinku ASIC (N7501) is faulty or the ASIC is badly soldered. For example: VINKU is not transmitting at all in EGSM900-band but TX-power is ok in other GSM-bands. Then it's quite clear that VINKU (N7501) is faulty or badly soldered and the component should be replaced.**

3.1.1.1.1 RF operating voltage VBAT_ASIC?

- Measurement can be done with an oscilloscope and a probe.

- Connect the probe to C7503 (or C7501, C7541)

- VBAT_ASIC voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

3.1.1.1.1.1 Ferrite inductor L7503 ok?

- Check that component is in place and solder joints are ok

- Measure voltage from the both ends of L7503. Is it faulty or is there short circuit in RF end?

- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

3.1.1.1.2 RFBUS signals ok?

- GSM receiver has to be active before RFBUS signals can be measured. Procedure is explained in section "GSM RX chain activation for manual measurements". Also WCDMA/GSM transmitter and WCDMA receiver activation can be used for the measurement but then RFBUS -signals don't necessarily look like in figures mentioned below.

- Measurements can be performed with an oscilloscope and a probe. Check all five RF BUS signals:

- *RFBUSDAT*: Connect the probe to J7504. Typical RFBUSDAT -signal is shown in section 6.5.9.3 "RFBUSDAT (GSM RX)"

- *RFBUSCLK*: Connect the probe to J7505. Typical RFBUSCLK -signal is shown in sections 6.5.9.1 "RFUSCLK (GSM RX)" and 6.5.9.2 "RFBUSCLK and RFBUSENA (GSM RX)"

- *RFBUSENA*: Connect the probe to J7506. Typical RFBUSENA -signal is shown in section 6.5.9.2 "RFBUSCLK and RFBUSENA (GSM RX)"

- *RXRESETX*: Connect the probe to J7515. RXRESETX -signal is a constant 2 V DC-signal after GSM or WCDMA transceiver has been activated the first time after phone boot up. The level of this signal should be about 0 V before transceiver activation.

- *TXRESETX*: Connect the probe to J7517. TXRESETX -signal is a constant 2 V DC-signal after GSM or WCDMA transceiver has been activated the first time after phone boot up. The level of this signal should be about 0 V before transceiver activation.

3.1.1.1.2.1 RAP3G (or Vinku or Hinku) faulty?

- RAP3G (D2800) cannot be replaced.

3.1.1.1.3 Vinku (N7501) regulator voltages VREG1, VREG2 ok?

- GSM transmitter has to be active before VREG1 and VREG2 voltages can be measured. Procedure is explained in section "Transmitter troubleshooting."

- Measurements can be done with an oscilloscope and a probe.

- VREG1: Connect the probe to C7543

- VREG2: Connect the probe to C7548 (or C7547)

- VREG1 and VREG2 voltage levels should be 2.65 – 2.86 V. Typical value is 2.7 V.

3.1.1.1.3.1 Vinku (N7501) RB_EXT voltage ok?

- GSM transmitter has to be active before Vinku's RB_EXT voltage can be measured. Procedure is explained in section "Transmitter troubleshooting".

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7521.
- RB_EXT voltage should be 1.325 – 1.375 V.

3.1.1.1.3.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.1.1.1.3.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

- Remember to solder a new component to R7503 pads after the measurement.

3.1.1.1.3.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.1.1.1.3.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

3.1.1.1.3.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

3.1.1.1.3.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.1.1.1.3.1.3.1 Is R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

3.1.1.1.3.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not

help go to the next step.

3.1.1.1.3.1.3.3 Replace Vinku (N7501) or Hinku (N7500) or both

3.1.1.1.3.1.4 Replace Vinku (N7501)

3.1.1.1.3.2 Are capacitors in Vinku (N7501) regulator lines working correctly?

VREG1: C7543

VREG2: C7547, C7548, C7554, C7555, C7553, C7552, C7558 and C7567

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that regulator lines are not short-circuited to the ground. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.1.1.1.3.3 TX VCO (G7502) ok?

3.1.1.1.3.4 Replace Vinku (N7501)

3.1.1.1.4 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513)
- VXO-voltage should be about 2.5 V

3.1.1.1.4.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

3.1.1.1.4.2 Replace Retu

3.1.1.1.4.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCXO (G7501) or all three components

3.1.1.1.5 VCP2-voltage ok?

- GSM transmitter has to be active before VCP2 voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C2221 (or C7550).
- VCP2 voltage should be about 4.75 V.

3.1.1.1.5.1 C7550 and C2221 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VCP2-line is short-circuited to the ground. If short-circuit is found replace C7550 and C2221. If this does not help go to the next steps.

3.1.1.1.5.2 Retu ok?

3.1.1.1.5.3 Vinku (N7501) ok?

3.1.1.1.6 Is there RF power in the TX VCO output at all?

- GSM transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing. *Quick VCO alive check can be done also without removing the RF shield. The RF probe should be placed as near the TX VCO output as possible (Put the head of the probe carefully inside the VCO can through the holes of the shield). Remember to use low RF Attenuator value in the spectrum analyser with this method.*
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The correct VCO frequency can be found in section "Frequency mappings". The output level of the VCO should be about -25 dBm during GSM TX burst.

3.1.1.1.6.1 TX VCO operating voltage VREG2 (VR2) ok?

- See section "Vinku (N7501) regulator voltages VREG1, VREG2 ok?"

3.1.1.1.6.2 Replace TX VCO (G7502)

3.1.1.1.7 Is TX VCO RF-signal coming to the Vinku at all?

- GSM transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.

- Check the level of the TX VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.1.1.1.7.1 Replace balun T7503

3.1.1.1.8 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3. "ST_CDSP_TX_IQ_TEST" these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

3.1.1.1.9 Is there TXC-signal coming to Vinku ASIC (N7501)?

- GSM transmitter has to be active before TX control voltage TXC can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level first to the maximum ("5" in EGSM900 and "0" in GSM1800/GSM1900)
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7549
- Typical TX control voltage TXC timing should look somehow similar to figure 6.5.2 "TXC in GSM mode (DC Offset 0 V)" (EGSM900 TX power level 5) and voltage levels should be roughly:

- EGSM900: 1.8 V while TX burst and 0 V otherwise.
- GSM1800/GSM1900: 1.8 V while TX burst and 0 V otherwise.

- Change the TX to the minimum power level ("19" in EGSM and "15" in GSM1800/GSM1900)
- Typical TX control voltage TXC levels should be now about:

- EGSM900: 1.0 V while TX burst and 0 V otherwise.
- GSM1800/GSM1900: 0.7 V while TX burst and 0 V otherwise.

3.1.1.1.9.1 R7514 in place?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7514 resistance value with an ohmmeter

3.1.1.1.9.2 C7549 working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that C7549is not short-circuited. If short-circuit is found replace the capacitor.

3.1.1.1.9.3 Retu ok?

3.1.1.1.10 VCTCXO frequency and output level correct?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCXO should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCXO output signal is presented in figure 6.5.1. "VCTCXO Output (DC Offset 1.24 V)"..

3.1.1.1.10.1 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513)
- VXO-voltage should be about 2.5 V

3.1.1.1.10.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

3.1.1.1.10.1.2 Replace Retu

3.1.1.1.10.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCXO (G7501) or all three components

3.1.1.1.10.2 BB AFC-voltage ok?

- See section "BB AFC-voltage ok?"

3.1.1.1.10.3 Replace VCTCXO G7501

3.1.1.1.11 Replace Vinku (N7501)

3.1.1.2 Is there RF-power in the GSM PA (N7502) input at all?

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the maximum (“5” in EGSM900 and “0” in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and

sweep time at least 2.5 seconds.

- EGSM900: Connect the probe to J7521 (test point). The RF level should be roughly -15...-20 dBm.
- GSM1800 or GSM1900: Connect the probe to R7512 output. The RF level should be roughly -20...-30 dBm.

3.1.1.2.1 EGSM900: Replace SAW Z7504

3.1.1.2.2 GSM1800/GSM1900: Is Vinku (N7501) output RF-signal coming to the T7502 (Balun)?

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”. Set TX power level to the maximum (“0” in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- GSM1800 or GSM1900: Connect the probe to T7502 input. There are two input ports in T7502 because the input port is balanced. The RF level should be roughly -25 dBm in both inputs.

3.1.1.2.2.1 Matching components ok?

GSM1800/GSM1900: C7575 and C7577

- Check that components are in place and solder joints are ok
- GSM1800 and GSM1900: Disconnect the power supply from the phone and use an ohmmeter to check that capacitors C7575 and C7577 are not short-circuited. If short-circuit is found replace the faulty capacitor.

3.1.1.2.3 GSM1800/GSM1900: Is there RF power in the balun (T7502) output at all?

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”. Set TX power level to the maximum (“0” in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- GSM1800 or GSM1900: Connect the probe to R7512 input. The RF level should be roughly -20...-30 dBm.

3.1.1.2.3.1 Replace balun T7502

3.1.1.2.4 GSM1800/GSM1900: Replace attenuator R7512

3.1.1.3 Does GSM PA (N7502) transmit RF-power at all?

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the **minimum** (“19” in EGSM900 and “15” in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- EGSM900: Connect the probe to J7520 (test point). The RF level should be about -16...-17 dBm.
- GSM1800 or GSM1900: Connect the probe to J7519 (test point). The RF level should be roughly -29...-30 dBm in both bands.

3.1.1.3.1 GSM PA (N7502) operating voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7593
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V

3.1.1.3.1.1 PA operating voltage VBAT_PA ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

3.1.1.3.1.1.1 Ferrite Z7500 ok?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

3.1.1.3.1.2 C7593 ok?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that the capacitor is not short-circuited. If short-circuit is found replace the capacitor.

3.1.1.3.1.3 Replace inductor L7516

- If replacing does not help, replace GSM PA (N7502)

3.1.1.3.2 Are bias currents coming correctly to the GSM PA (N7502)?

EGSM: Icont_21 and Icont_22
GSM1800/GSM1900: Icont_31 and Icont_32

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to the maximum ("5" in EGSM900 and "0" in GSM1800/GSM1900)
- Measurements can be done with an oscilloscope and a VOLTAGE probe.
- EGSM900:

- Connect the probe to C7545 or C7544. Notice: C7544 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.
- Typical full TX power bias currents (Icont_21 and Icont_22) should look somehow similar to figure 6.5.4 "Icont_21/Icont_22 (DC offset 1.2V)" when measured with an oscilloscope and a probe. Check both currents.

- GSM1800 or GSM1900:

- Connect the probe to C7561 or C7556. Notice: C7556 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.
- Typical full TX power bias currents (Icont_31 and Icont_32) should look somehow similar to figure 6.5.5 when measured with an oscilloscope and a probe. Check both currents.

3.1.1.3.2.1 Vinku (N7501) RB_EXT voltage ok?

- See section "Vinku (N7501) RB_EXT voltage ok?"

3.1.1.3.2.2 Are capacitors in GSM PA (N7502) bias lines working correctly?

EGSM: Icont_21 missing – Replace Vinku
Icont_22 missing – C7545 short-circuited?
GSM1800/GSM1900: Icont_31 missing – C7556 short-circuited?
Icont_32 missing – C7561 short-circuited?

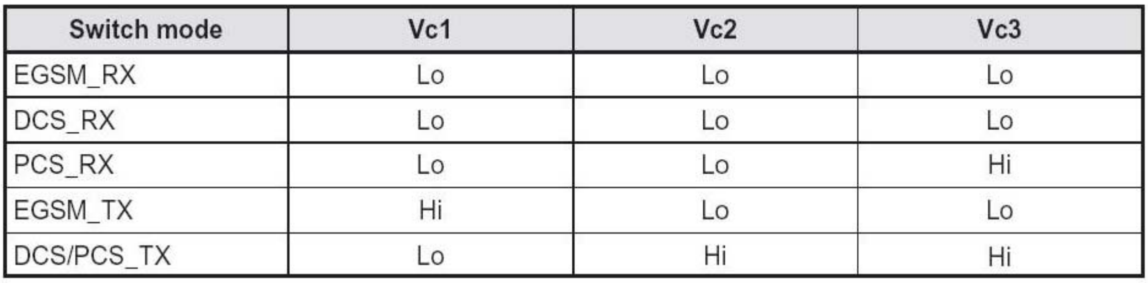
- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.1.1.3.2.3 Replace Vinku (N7501)

3.1.1.3.3 Replace PA (N7502)

3.1.1.4 Are control voltages VC1, VC2 and VC3 coming correctly to the antenna switch (Z7503)?

- Use “RF Controls” window in Phoenix test software to activate the GSM transmitter and to select the wanted GSM band. Procedure is explained in section “Transmitter troubleshooting”. GSM RX activation is described in section “GSM RX chain activation for manual measurements”.
- Use an oscilloscope and probe to find out if antenna switch control lines are working according to table shown below. “Hi” means that there is 2.4 – 2.8 V control voltage level in the corresponding control line. “Lo” means levels 0 – 0.2 V. Remember to trigger the oscilloscope because control voltages VC1, VC2 and VC3 are pulsed
- Connect the probe to correct test points to measure VC1, VC2 and VC3 voltages (check test point locations from section “Test point locations”). Notice: these test points are PWB pads for three non-assembled capacitors.



Switch mode	Vc1	Vc2	Vc3
EGSM_RX	Lo	Lo	Lo
DCS_RX	Lo	Lo	Lo
PCS_RX	Lo	Lo	Hi
EGSM_TX	Hi	Lo	Lo
DCS/PCS_TX	Lo	Hi	Hi

3.1.1.4.1 Replace Hinku (N7500)

3.1.1.5 Replace antenna Switch Z7503

3.1.2 Does GSM TX transmit enough RF-power and power levels otherwise ok?

3.1.2.1 Is Vinku ASIC (N7501) transmitting correct RF-power?

- GSM transmitter has to be active before Vinku’s output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- EGSM900:

- Connect the RF probe to Z7504 input. The level should be about the same on both input pins. Check output level with at least the maximum (5) and the minimum (19) power levels.
- Maximum power level – Output level should be about -15...-25 dBm
- Minimum power level – Output level should be about -45...-55 dBm

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- GSM1800/GSM1900:

- Connect the RF probe to C7577 or C7575. The level should be about the same on both capacitors. Check output level with at least the maximum (0) and the minimum (15) power levels.

- Maximum power level – Output level should be about -25...-35 dBm

- Minimum power level – Output level should be about -55...-65 dBm

- Check if output levels of Vinku are as expected.

- **NOTE! If VINKU ASIC is transmitting wrong TX power just in one or two GSM-bands, typically this means that Vinku ASIC (N7501) is faulty or the ASIC is badly soldered. Of course SAW-filter Z7504 or balun T7502 can be also faulty/badly soldered and causing short-circuit, but probability to this is quite low. For example: VINKU is transmitting too low power in EGSM900-band but TX-power is ok in other GSM-bands. Then it's almost clear that VINKU (N7501) is faulty or badly soldered and the component should be replaced.**

3.1.2.1.1 RF operating voltage VBAT_ASIC ok?

- See section "RF operating voltage VBAT_ASIC ok?"

3.1.2.1.2 Are Vinku (N7501) regulator voltages VREG1, VREG2 ok?

- GSM transmitter has to be active before VREG1 and VREG2 voltages can be measured. Procedure is explained in section "Transmitter troubleshooting".

- Measurements can be done with an oscilloscope and a probe.

- VREG1: Connect the probe to C7543

- VREG2: Connect the probe to C7548 (or C7547)

- VREG1 and VREG2 voltage levels should be 2.65 – 2.86 V. Typical value is 2.7 V.

3.1.2.1.2.1 Vinku (N7501) RB_EXT voltage ok?

- GSM transmitter has to be active before Vinku's RB_EXT voltage can be measured. Procedure is explained in section "Transmitter troubleshooting".

- Measurement can be done with an oscilloscope and a probe.

- Connect the probe to R7521.

- RB_EXT voltage should be 1.325 – 1.375 V.

3.1.2.1.2.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.

- Connect the probe to R7503.

- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.1.2.1.2.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

- Remember to solder a new component to R7503 pads after the measurement.

3.1.2.1.2.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.1.2.1.2.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

3.1.2.1.2.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

3.1.2.1.2.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.1.2.1.2.1.3.1 Is R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

3.1.2.1.2.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.1.2.1.2.1.3.3 Replace Vinku (N7501) or Hinku (N7500) or both

3.1.2.1.2.2 Replace Vinku (N7501)

3.1.2.1.3 Are TX-IQ signal waveforms looking correct?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3 ST_CDSP_TX_IQ_TEST these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

3.1.2.1.4 Is the TXC-signal coming to Vinku ASIC (N7501) OK? Is signal level correct?

- GSM transmitter has to be active before TX control voltage TXC can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level first to the maximum (“5” in EGSM900 and “0” in GSM1800/GSM1900)
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7549
- Typical TX control voltage TXC timing should look somehow similar to figure 6.5.2 “TXC in GSM mode (DC offset 0 V)” (EGSM900 TX power level 5) and voltage levels should be roughly:

- EGSM900: 1.8 V while TX burst and 0 V otherwise.
- GSM1800/GSM1900: 1.8 V while TX burst and 0 V otherwise.

- Change the TX to the minimum power level (“19” in EGSM and “15” in GSM1800/GSM1900)
- Typical TX control voltage TXC levels should be now about:

- EGSM900: 1.0 V while TX burst and 0 V otherwise.

- GSM1800/GSM1900: 0.7 V while TX burst and 0 V otherwise.

3.1.2.1.4.1 R7514 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R514 resistance value with an ohmmeter

3.1.2.1.4.2 C7549 working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check with an ohmmeter that C7549 is not short-circuited.

3.1.2.1.4.3 Retu ok?

3.1.2.1.5 Does GSM PA (N7502) get correct DET_SW_G -voltage from Vinku ASIC (N7501)?

- GSM transmitter has to be active before DET_SW_G voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7595 pad. Notice: C7595 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.
- DET_SW_G voltage should be about 2.8 V while TX burst and 0 V otherwise.

3.1.2.1.5.1 C7595 working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check with an ohmmeter that C7595 is not short-circuited.

3.1.2.1.5.2 Replace Vinku (N7501)

3.1.2.1.6 Are components in GSM power control loop in place and working ok?

R7516 and C7559

- Disconnect the power supply from the phone and use an ohmmeter to check that C7559 is not short-circuited. If short-circuit is found replace the capacitor.
- Check R7516 resistance value with an ohmmeter and replace resistor if needed.

3.1.2.1.7 Is TX VCO signal level in the T7503 output high enough?

- GSM transmitter has to be active before TX VCO’s output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines during GSM TX burst. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.1.2.1.7.1 TX VCO G7502 output level high enough?

- GSM transmitter has to be active before TX VCO’s output frequency and output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm during GSM TX burst.

3.1.2.1.7.1.1 Replace TX VCO G7502

3.1.2.1.7.2 Replace balun T7503

3.1.2.1.8 Replace Vinku (N7501) or GSM PA (N7502)

- If the output level of Vinku is higher than wanted then replace GSM PA (N7502). Otherwise replace TX ASIC Vinku (N7501).

3.1.2.2 Does GSM PA (N7502) have enough RF-power in its input?

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the maximum (“5” in EGSM900 and “0” in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- EGSM900: Connect the probe to J7521 (test point). The RF level should be roughly -15...-20 dBm.
- GSM1800 or GSM1900: Connect the probe to R7512 output. The RF level should be roughly -20...-30 dBm.

3.1.2.2.1 EGSM900: Replace SAW Z7504

3.1.2.2.2 GSM1800/GSM1900: Is Vinku (N7501) output RF-signal coming correctly to the T7502 (Balun)?

- GSM transmitter has to be active before measurements Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the maximum (“0” in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- GSM1800 or GSM1900: Connect the probe to T7502 input. There are two input ports in T7502 because the input port is balanced. The RF level should be roughly -25 dBm in both inputs.

3.1.2.2.2.1 Matching components ok?

GSM1800/GSM1900: C7575 and C7577

- Check that components are in place and solder joints are ok
- GSM1800 and GSM1900: Disconnect the power supply from the phone and use an ohmmeter to check that capacitors C7575 and C7577 are not short-circuited. If short-circuit is found replace the faulty capacitor.

3.1.2.2.3 GSM1800/GSM1900: Is there correct RF power in the balun (T7502) output?

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to the maximum ("0" in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- GSM1800 or GSM1900: Connect the probe to R7512 input. The RF level should be roughly -20...-30 dBm.

3.1.2.2.3.1 Replace balun T7502

3.1.2.2.4 GSM1800/GSM1900: Replace attenuator R7512

3.1.2.3 GSM PA (N7502) transmitting correct RF-power?

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to the **minimum** ("19" in EGSM900 and "15" in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- EGSM900: Connect the probe to J7520 (test point). The RF level should be about -16...-17 dBm.
- GSM1800 or GSM1900: Connect the probe to J7519 (test point). The RF level should be roughly -29...-30 dBm in both bands.

3.1.2.3.1 GSM PA (N7502) operating voltage ok?

- Measurement can be done with an oscilloscope and a probe.

- Connect the probe to C7593
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

3.1.2.3.1.1 PA operating voltage VBAT_PA ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

3.1.2.3.1.1.1 Ferrite Z7500 ok?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

3.1.2.3.1.2 C7593 ok?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that the capacitor is not short-circuited. If short-circuit is found replace the capacitor.

3.1.2.3.1.3 Replace inductor L7516

- If replacing doesn’t help then replace GSM PA (N7502)

3.1.2.3.2 Are bias currents coming correctly to the GSM PA (N7502)? Level ok?

EGSM: Icont_21 and Icont_22
GSM1800/GSM1900: Icont_31 and Icont_32

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the maximum (“5” in EGSM900 and “0” in GSM1800/GSM1900)
- Measurements can be done with an oscilloscope and a VOLTAGE probe.
- EGSM900:

- Connect the probe to C7545 or C7544. Notice: C7544 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB

- Typical full TX power bias currents (Icont_21 and Icont_22) should look somehow similar to figure 6.5.4 “Icont_21/Icont_22 (DC Offset 1.2 V)” when measured with an oscilloscope and a probe. Check both currents.

- GSM1800 or GSM1900:

- Connect the probe to C7561 or C7556. Notice: C7556 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB

- Typical full TX power bias currents (Icont_31 and Icont_32) should look somehow similar to figure 6.5.5 “Icont_31/Icont_32 (DC Offset 1.2 V)” when measured with an oscilloscope and a probe. Check both currents.

3.1.2.3.2.1 Vinku (N7501) RB_EXT voltage ok?

- See section "Vinku (N7501) RB_EXT voltage ok?"

3.1.2.3.2.2 Are capacitors in GSM PA (N7502) bias lines working correctly?

EGSM: Icont_21 missing – Replace Vinku
Icont_22 missing – C7545 short-circuited?
GSM1800/GSM1900: Icont_31 missing – C7556 short-circuited?
Icont_32 missing – C7561 short-circuited?

- Check that components are in place and solder joints are ok

- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above.

3.1.2.3.2.3 Replace Vinku (N7501) or GSM PA (N7502)

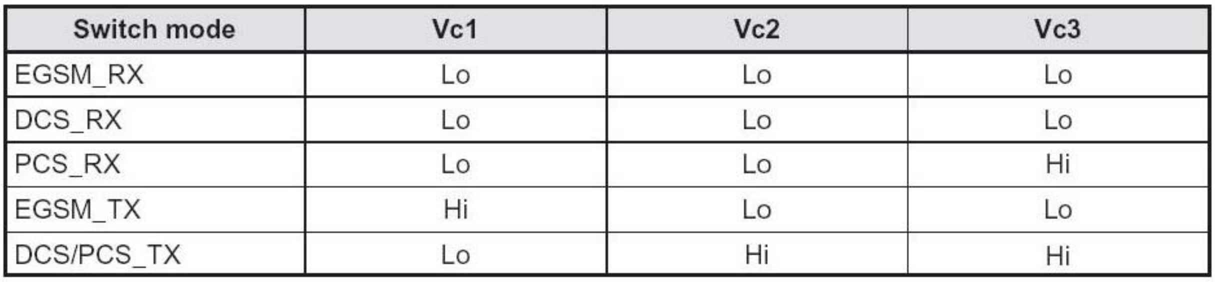
3.1.2.3.3 Replace GSM PA (N7502)

3.1.2.4 Are control voltages VC1, VC2 and VC3 coming correctly to the antenna switch (Z7503)?

- Use “RF Controls” window in Phoenix test software to activate the GSM transmitter and to select the wanted GSM band. Procedure is explained in section “Transmitter troubleshooting”. GSM RX activation is described in section “GSM RX chain activation for manual measurements”.

- Use an oscilloscope and probe to find out if antenna switch control lines are working according to table shown below. “Hi” means that there is 2.4 – 2.8 V control voltage level in the corresponding control line. “Lo” means levels 0 – 0.2 V. Remember to trigger the oscilloscope because control voltages VC1, VC2 and VC3 are pulsed

- Connect the probe to correct test points to measure VC1, VC2 and VC3 voltages (check test point locations, see section “Test point locations). Notice: these test points are PWB pads for three non-assembled capacitors.



Switch mode	Vc1	Vc2	Vc3
EGSM_RX	Lo	Lo	Lo
DCS_RX	Lo	Lo	Lo
PCS_RX	Lo	Lo	Hi
EGSM_TX	Hi	Lo	Lo
DCS/PCS_TX	Lo	Hi	Hi

3.1.2.4.1 Replace Hinku (N7500)

3.1.2.5 Replace antenna Switch Z7503

3.1.2.6 Replace antenna switch Z7503

3.1.3 GSM transmitter frequency correct?

- Connect a spectrum analyser to the module test jig's RF connector.
- Set GSM Tx ON. Procedure is explained in section "Transmitter troubleshooting".
- Check if the frequency of the GSM transmitter is as expected. If output signal is not found try to use 500 MHz span setting.

  The correct TX frequency is shown in Phoenix "RF Controls (GSM)" window and can be found also in see section "Frequency mappings". If the frequency is not found at all then go to 3.1.1 "Does GSM TX transmit RF-power at all?"

3.1.3.1 Is TX VCO frequency as expected?

- GSM transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing. *Quick VCO alive check can be done without removing the RF shield. The RF probe should be placed as near the TX VCO output as possible (Put the head of the probe carefully inside the VCO can through the holes of the shield). This method can be used only to check that the TX VCO is alive. It won't expose if the T7503 is broken or the output level of the VCO is too low. Remember to use low RF Attenuator value in the spectrum analyser with this method.*
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm during GSM TX burst.

3.1.3.1.1 C7543, C7548 and L7517 ok?

- These components should be checked if TX VCO frequency is not stable and TX PLL frequency not locked.
- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

3.1.3.1.2 TX VCO control voltage VC ok?

- GSM transmitter has to be active before TX VCO control voltage VC can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7519.
- Typical TX VCO control voltage VC should look somehow similar to figure 6.5.3 “TX VC in GSM mode (DC offset 1.8V). DC voltage level should change if TX channel is changed. VC is lower on lower channels and higher if higher channel numbers are used.

3.1.3.1.2.1 VCP2-voltage ok?

- GSM transmitter has to be active before VCP2 voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C2221 (or C7550).
- VCP2 voltage should be about 4.75 V.

3.1.3.1.2.1.1 C7550 and C2221 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VCP2-line is short-circuited to the ground. If short-circuit is found replace C7550 and C2221. If this does not help go to the next steps.

3.1.3.1.2.1.2 Retu ok?

3.1.3.1.2.1.3 Vinku (N7501) ok?

3.1.3.1.2.2 Vinku (N7501) RB_EXT voltage ok?

- See section "Vinku (N7501) RB_EXT voltage ok?"

3.1.3.1.2.3 Balun T7503 ok?

- GSM transmitter has to be active before TX VCO’s output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the TX VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is

not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.1.3.1.2.4 Components near TX VCO ok?

C7571, R7519, R7523, C7573 and C7568 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter.
- Use an ohmmeter to check also that capacitors are not short-circuited

3.1.3.1.2.5 Replace Vinku (N7501) or TX VCO (G7502) or both

3.1.3.1.3 Replace TX VCO G7502

3.1.3.2 Is TX VCO signal level in the T7503 output high enough?

- GSM transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines during GSM TX burst. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.1.3.2.1 TX VCO G7502 output level high enough?

- GSM transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider

span setting. The output level of the VCO should be about -25 dBm during GSM TX burst.

3.1.3.2.1.1 Replace TX VCO G7502

3.1.3.2.2 Replace balun T7503

3.1.3.3 VCTCXO frequency and output level ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCXO should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCXO output signal is presented in figure 6.5.1 "VCTCXO Output (DC Offset 1.24 V)".

3.1.3.3.1 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513)
- VXO-voltage should be about 2.5 V

3.1.3.3.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

3.1.3.3.1.2 Replace Retu

3.1.3.3.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCXO (G7501) or all three components

3.1.3.3.2 BB AFC-voltage ok?

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to R7509 (or C7533)
- AFC-voltage may vary between 0.1 - 2.3 V. Typical value is 1.2 V. Phoenix “RF Controls” tool can be used to change the AFC value. Voltage level should be about 0.1 V with AFC value -1024 and about 2.3 V with AFC value 1023.

3.1.3.3.2.1 Low pass filter components R7509 and C7533 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7509 resistance value with an ohmmeter.
- Use an ohmmeter to find out also if the AFC-line is short-circuited to the ground. If short-circuit is

found replace C7533. If this does not help then go to the next steps.

3.1.3.3.2.2 VCTCXO ok?

- Remove R7509. If AFC-voltage is correct after removing then replace faulty VCTCXO G7501 and solder R7509 (new component) back to the PWB

3.1.3.3.2.3 Replace Retu

3.1.3.3.3 Replace VCTCXO G7501

3.2 Does the phone give realistic RSSI-values?

Attach the phone to the product specific test jig and a signal generator to the RF-coupler. Coupler attenuation should be also taken into account during measurements.

Use the signal generator to supply -90 dBm RF-level (unmodulated signal) to the phone via the antenna coupler. Set generator RF-level to -90 dBm + cable and coupler attenuation. This measurement should be performed in a RF-shielded environment because existing GSM-network base stations can disturb this measurement otherwise.

- Set RF-generator frequency as following:

- EGSM900: 942.46771 MHz (channel 37)

- GSM1800: 1842.86771 MHz (channel 700)

- GSM1900: 1960.06771 MHz (channel 661)

- Use Phoenix testing & tuning software to perform GSM receiver activation and RSSI measurement for proper channels. Procedure is explained in section “GSM RX chain activation for manual measurements” (Start “Testing” -> “GSM” -> “RSSI Reading” tool in Phoenix. Select the correct band and channel).

- “RSSI Reading” -tool should show quite exact -90 dBm RSSI level. Remember to take into account attenuation between the phone and signal generator. Test also Q and I branches separately. Signal level in both I and Q lines should be about -93 dBm

- Increase signal generator RF level to -60 dBm. Phoenix ”RSSI Reading” tool should show now quite exact RSSI level -60 dBm. Test also Q and I branches separately. Signal level in both I and Q lines should be about -63 dBm

- If RSSI-levels are not as expected separate the phone into parts and place to the module jig. Connect the signal generator to the module jig GSM RF connector (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).

3.2.1 Is Hinku (N7500) ASIC receiving RF-power correctly from the GSM-antenna connector?

- GSM receiver has to be active before measurements. Procedure is explained in section “GSM RX chain activation for manual measurements.”

- Connect an RF-generator to the GSM-antenna connector
- Set RF-generator frequency as following:
- EGSM900: 942.46771 MHz
- GSM1800: 1842.86771 MHz
- GSM1900: 1960.06771 MHz
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser (Centre frequency should be set to the same frequency as the RF-generator). RBW and VBW = 10 kHz, Span = 0 kHz, sweep time 5 ms.
- RF-signals in this measurement are pulsed and video triggering is needed in the spectrum analyser (software dependent issue. With some phone softwares these signals are constant in “Local” mode and triggering is not needed)
- EGSM900: Connect the probe to C7512 or C7514. The RF level should be roughly -85 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both capacitors. Remember to select the correct band also in Phoenix.
- GSM1800: Connect the probe to C7581 or C7584. The RF level should be roughly -85...-90 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both capacitors. Remember to select the correct band also in Phoenix.
- GSM1900: Connect the probe to C7523 or C7525. The RF level should be roughly -85...-90 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both capacitors. Remember to select the correct band also in Phoenix.
- **NOTE! If RSSI-values are correct only in one or two GSM-bands but RX ASIC HINKU (N7500) is receiving RF-power correctly from the GSM antenna connector in all three GSM-bands, typically this means that Hinku ASIC (N7500) is faulty or the ASIC is badly soldered. For example: RSSI-values are not realistic in EGSM900-band but are ok in other bands and HINKU is receiving RF-power correctly in all bands. Then it’s quite clear that HINKU (N7500) is faulty or badly soldered and the component should be replaced.**

3.2.1.1 Is Z7503 (antenna switch) working correctly?

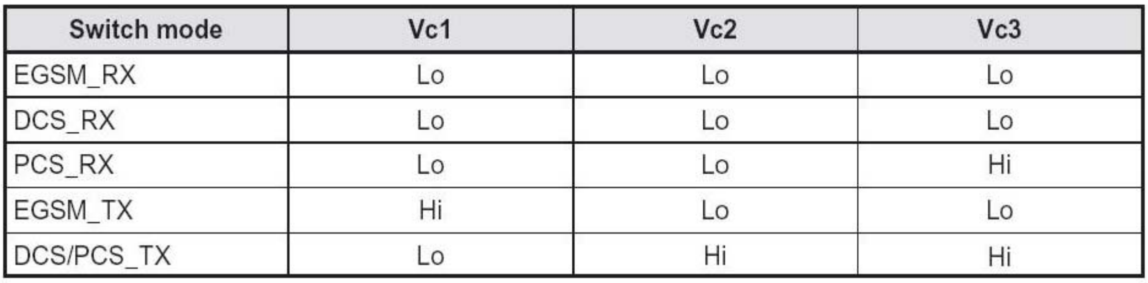
- GSM receiver has to be active before measurements. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Connect an RF-generator to the GSM-antenna connector
- Set RF-generator frequency as following:
- EGSM900: 942.46771 MHz (Channel 37)
- GSM1800: 1842.86771 MHz (Channel 700)
- GSM1900: 1960.06771 MHz (Channel 661)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct

frequency settings to the spectrum analyser (Centre frequency should be set to the same frequency as the RF-generator). RBW and VBW = 10 kHz, Span = 0 kHz, sweep time 5 ms.

- RF-signals in this measurement are pulsed and video triggering is needed in the spectrum analyser (software dependent issue. With some phone softwares these signals are constant in “Local” mode and triggering is not needed).
- EGSM900: Connect the probe to L7504. The RF level should be roughly -75 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both ends of the inductor. Remember to select the correct band also in Phoenix.
- GSM1800: Connect the probe to L7505. The RF level should be roughly -85 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both ends of the inductor. Remember to select the correct band also in Phoenix.
- GSM1900: Connect the probe to L7506. The RF level should be roughly -85 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both ends of the inductor. Remember to select the correct band also in Phoenix.

3.2.1.1.1 Are control voltages VC1, VC2 and VC3 coming correctly to the antenna switch (Z7503)?

- Use “RF Controls” window in Phoenix test software to activate the GSM transmitter and to select the wanted GSM band. Procedure is explained in section “Transmitter troubleshooting”. GSM RX activation is described in section “GSM RX chain activation for manual measurements”.
- Use an oscilloscope and probe to find out if antenna switch control lines are working according to table shown below. “Hi” means that there is 2.4 – 2.8 V control voltage level in the corresponding control line. “Lo” means levels 0 – 0.2 V. Remember to trigger the oscilloscope because control voltages VC1, VC2 and VC3 are pulsed
- Connect the probe to correct test points to measure VC1, VC2 and VC3 voltages (check test point locations, see section “Test point locations”). Notice: these test points are PWB pads for three non-assembled
capacitors.



Switch mode	Vc1	Vc2	Vc3
EGSM_RX	Lo	Lo	Lo
DCS_RX	Lo	Lo	Lo
PCS_RX	Lo	Lo	Hi
EGSM_TX	Hi	Lo	Lo
DCS/PCS_TX	Lo	Hi	Hi

3.2.1.1.1.1 Replace Hinku (N7500)

3.2.1.1.2 Replace antenna switch Z7503

3.2.1.2 Are matching components in place and working correctly?

EGSM900: C7512, C7514 and L7504

GSM1800: C7581, C7584 and L7505

GSM1900: C7523, C7525 and L7506

- Check that components are in place and solder joints are ok
- Use an ohmmeter to check that inductors are conducting DC.
- Replace matching components

3.2.2 Are RX-IQ signal waveforms and levels correct?

- Measurements can be done with an oscilloscope, a probe and signal generator.
- GSM receiver has to be active before RX IQ-signals can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Apply –70 dBm RF signal from a signal generator to the module jig antenna connector and use following frequencies:

- EGSM900: 942.46771 MHz (Channel 37)
- GSM1800: 1842.86771 MHz (Channel 700)
- GSM1900: 1960.06771 MHz (Channel 661)

- Remember to change correct RX channels also to Phoenix “RF controls” window!
- Check RX I and RX Q -signals in following test points:

- RX I (positive): Connect the probe to test point J7508
- RX I (negative): Connect the probe to test point J7509
- RX Q (positive): Connect the probe to test point J7510
- RX Q (negative): Connect the probe to test point J7511

- The correct RX IQ-signal is shown in figure 6.5.6 "GSM RX IQ (DC Offset 0.4 V)". Level of all four IQ-signals should be about the same and RX IQ-signal frequency should be 67.71 kHz (lower detail figure). The phase shift between I- and Q-signals should be 90 degrees.

3.2.2.1 RF operating voltage VBAT_ASIC ok?

- See section “RF operating voltage VBAT_ASIC ok?”

3.2.2.2 RFBUS signals ok?

- GSM receiver has to be active before RFBUS signals can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”. Also WCDMA/GSM transmitter and WCDMA receiver activation can be used for the measurement but then RFBUS -signals don’t necessarily look like in figures mentioned below.
- Measurements can be performed with an oscilloscope and a probe. Check all five RF BUS signals:

- *RFBUSDAT*: Connect the probe to J7504. Typical RFBUSDAT -signal is shown in figures in section 6.5.9.3 “RFBUSDAT (GSM RX)”.

- *RFBUSCLK*: Connect the probe to J7505. Typical RFBUSCLK -signal is shown in section 6.5.9.1 “RFBUSCLK (GSM RX)” and 6.5.9.2 “RFBUSCLK and RFBUSENA (GSM RX)”

- *RFBUSENA*: Connect the probe to J7506. Typical RFBUSENA -signal is shown in section 6.5.9.2 “RFBUSCLK and RFBUSENA (GSM RX)”

- *RXRESETX*: Connect the probe to J7515. RXRESETX -signal is a constant 2 V DC-signal after GSM or WCDMA transceiver has been activated the first time after phone boot up. The level of this signal should be about 0 V before transceiver activation.

- *TXRESETX*: Connect the probe to J7517. TXRESETX -signal is a constant 2 V DC-signal after GSM or WCDMA transceiver has been activated the first time after phone boot up. The level of this signal should be about 0 V before transceiver activation.

3.2.2.2.1 RAP3G (or Vinku or Hinku) faulty?

- RAP3G (D2800) cannot be replaced.

3.2.2.3 Hinku (N7500) regulator voltage VR1 ok?

- GSM receiver has to be active before Hinku’s VR1 voltage can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.

- Measurements can be done with an oscilloscope and a probe.

- Connect the probe to C7504 (or C7505)

- VR1 voltage level should be 2.65 – 2.86 V. Typical value is 2.7 V.

3.2.2.3.1 Hinku (N7500) RB_EXT voltage ok?

- GSM receiver has to be active before Hinku’s RB_EXT voltage can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.

- Measurement can be done with an oscilloscope and a probe.

- Connect the probe to R7504.

- RB_EXT voltage should be 1.325 – 1.375 V.

3.2.2.3.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.

- Connect the probe to R7503.

- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.2.2.3.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

Remember to solder a new component to R7503 pads after measurement.

3.2.2.3.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.2.2.3.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

3.2.2.3.1.1.2 Retu ok?

3.2.2.3.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R521 and R504 resistance values with an ohmmeter.

3.2.2.3.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.2.2.3.1.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

3.2.2.3.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.2.2.3.1.3.3 Replace Hinku (N7500) or Vinku (N7501) or both

3.2.2.3.1.4 Replace Hinku (N7500)

3.2.2.3.2 Are capacitors in Hinku (N7500) regulator lines working correctly?

C7504, C7515, C7509, C7508, C7596, C7598 and C7505

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.2.2.3.3 RX VCO G7500 ok?

3.2.2.3.4 Replace Hinku (N7500)

3.2.2.4 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513)
- VXO-voltage should be about 2.5 V

3.2.2.4.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

3.2.2.4.2 Replace Retu

3.2.2.4.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCXO (G7501) or all three components

3.2.2.5 VCP1-voltage ok?

- GSM receiver has to be active before VCP1 voltage can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7507.
- VCP1 voltage should be about 4.75 V.

3.2.2.5.1 C7507 and C2222 working properly?

- Check that the components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that C507 and C2222 are not short-circuited.

3.2.2.5.2 Retu ok?

3.2.2.5.3 Hinku (N7500) ok?

3.2.2.6 VCTCXO frequency and output level correct?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCXO should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCXO output signal is presented in figure 6.5.1 "VCTCXO Output (DC Offset 1.24 V)".

3.2.2.6.1 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513)
- VXO-voltage should be about 2.5 V

3.2.2.6.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

3.2.2.6.1.2 Replace Retu

3.2.2.6.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCXO (G7501) or all three components

3.2.2.6.2 BB AFC-voltage ok?

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to R7509 (or C7533)
- AFC-voltage may vary between 0.1 - 2.3 V. Typical value is 1.2 V. Phoenix “RF Controls” tool can be used to change the AFC value. Voltage level should be about 0.1 V with AFC value -1024 and about 2.3 V with AFC value 1023.

3.2.2.6.2.1 Low pass filter components R7509 and C7533 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7509 resistance value with an ohmmeter.
- Use an ohmmeter to find out also if the AFC-line is short-circuited to the ground. If short-circuit is found replace C7533. If this does not help then go to the next steps.

3.2.2.6.2.2 VCTCXO ok?

- Remove R7509. If AFC-voltage is correct after removing then replace faulty VCTCXO G7501 and solder R7509 (new component) back to the PWB

3.2.2.6.2.3 Replace Retu

3.2.2.6.3 Replace VCTCXO G7501

3.2.2.7 Is there RF power in the RX VCO output at all?

- GSM receiver has to be active before RX VCO’s output frequency and output level can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre

frequency should be set according the used RX channel (see section "Frequency mappings").

- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during RX is active (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7501 input.
- Check if the frequency of the RX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -20...-30 dBm.

3.2.2.7.1 RX VCO operating voltage VR1 RX ok?

- GSM receiver has to be active before Hinku's VR1 voltage can be measured. Procedure is explained in GSM RX chain activation for manual measurements.
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7504 (or C7505) VR1 voltage level should be 2.65 – 2.86 V. Typical value is 2.7 V.

3.2.2.7.1.1 Hinku (N7500) regulator voltage VR1 ok?

- See section "Hinku (N7500) regulator voltage VR1 ok?"

3.2.2.7.1.2 Replace Hinku (N7500)

3.2.2.7.2 Replace RX VCO (G7500)

3.2.2.8 Is RX VCO RF-signal coming to the Hinku at all?

- GSM receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section "GSM RX chain activation for manual measurements".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during RX is active (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the VCO frequency in T7501 outputs. The level should be about -25...-35 dBm in both output lines. If the signal level is correct in the input (about -20...-30 dBm) but output level is not as expected then replace T7501.

3.2.2.8.1 Replace balun T7501

3.2.2.9 Is RX VCO frequency as expected?

- GSM receiver has to be active before RX VCO's output frequency and output level can be measured.

Procedure is explained in section “GSM RX chain activation for manual measurements”.

- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during RX is active (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7501 input.
- Check if the frequency of the RX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -20...-30 dBm.

3.2.2.9.1 RX VCO control voltage VC ok?

- GSM receiver has to be active before RX VCO control voltage VC can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7501.
- Typical RX VCO control voltage VC should look somehow similar to figure 6.5.7 (GSM mode). VC voltage should be between 0.7 - 3.8 V. DC voltage level should change if RX channel is changed. VC is lower on lower channels and higher if higher channel numbers are used.

3.2.2.9.1.1 VCP1-voltage ok?

- GSM receiver has to be active before VCP1 voltage can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7507.
- VCP1 voltage should be about 4.75 V.

3.2.2.9.1.1.1 C7507 and C2222 working properly?

- Check that the components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that C507 and C2222 are not short-circuited.

3.2.2.9.1.1.2 Retu ok?

3.2.2.9.1.1.3 Hinku (N7500) ok?

3.2.2.9.1.2 Hinku (N7500) RB_EXT voltage ok?

- GSM receiver has to be active before Hinku’s RB_EXT voltage can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7504.
- RB_EXT voltage should be 1.325 – 1.375 V.

3.2.2.9.1.2.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.2.2.9.1.2.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

Remember to solder a new component to R7503 pads after measurement.

3.2.2.9.1.2.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.2.2.9.1.2.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

3.2.2.9.1.2.1.2 Retu ok?

3.2.2.9.1.2.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R521 and R504 resistance values with an ohmmeter.

3.2.2.9.1.2.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.2.2.9.1.2.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

3.2.2.9.1.2.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok

- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.2.2.9.1.2.3.3 Replace Hinku (N7500) or Vinku (N7501) or both

3.2.2.9.1.2.4 Replace Hinku (N7500)

3.2.2.9.1.3 Balun T7501 ok?

- GSM receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section "GSM RX chain activation for manual measurements".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during RX is active (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the VCO frequency in T7501 outputs. The level should be about -25...-35 dBm in both output lines. If the signal level is correct in the input (about -20...-30 dBm) but output level is not as expected then replace T7501.

3.2.2.9.1.4 Are components near the RX VCO ok?

R7501, C7516, R7505, C7524 and C7522 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter.
- Use an ohmmeter to check also that capacitors are not short-circuited

3.2.2.9.1.5 Replace Hinku (N7500) or RX VCO (G7500) or both

3.2.2.9.2 Replace RX VCO G7500

3.2.2.10 Is RX VCO signal level in the T7501 output high enough?

- GSM receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section "GSM RX chain activation for manual measurements".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during RX is active (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the VCO frequency in T7501 outputs. The level should be about -25...-35 dBm in

both output lines. If the signal level is correct in the input (about -20...-30 dBm) but output level is not as expected then replace T7501.

3.2.2.10.1 RX VCO G7500 output level high enough?

- GSM receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section "GSM RX chain activation for manual measurements".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during RX is active (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7501 input.
- Check if the frequency of the RX VCO is as expected. If the VCO signal is not found try to use wider span setting. Output level of the VCO should be about -20...-30 dBm.

3.2.2.10.1.1 Replace RX VCO G7500

3.2.2.10.2 Replace balun T7501

3.2.2.11 VCTCXO frequency and output level correct?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCXO should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCXO output signal is presented in figure 6.5.1 "VCTCXO Output (DC Offset 1.24 V)".

3.2.2.11.1 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513)
- VXO-voltage should be about 2.5 V

3.2.2.11.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

3.2.2.11.1.2 Replace Retu

3.2.2.11.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCXO (G7501) or all three components

3.2.2.11.2 BB AFC-voltage ok?

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to R7509 (or C7533)
- AFC-voltage may vary between 0.1 - 2.3 V. Typical value is 1.2 V. Phoenix “RF Controls” tool can be used to change the AFC value. Voltage level should be about 0.1 V with AFC value -1024 and about 2.3 V with AFC value 1023.

3.2.2.11.2.1 Low pass filter components R7509 and C7533 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7509 resistance value with an ohmmeter.
- Use an ohmmeter to find out also if the AFC-line is short-circuited to the ground. If short-circuit is found replace C7533. If this does not help then go to the next steps.

3.2.2.11.2.2 VCTCXO ok?

- Remove R7509. If AFC-voltage is correct after removing then replace faulty VCTCXO G7501 and solder R7509 (new component) back to the PWB

3.2.2.11.2.3 Replace Retu

3.2.2.11.3 Replace VCTCXO G7501

3.2.2.12 Replace Hinku ASIC (N7500)

3.2.3 Is RAP3G ASIC getting ok VREFCM-signal from Hinku (N7500)? Signal level ok?

- GSM receiver has to be active before VREFCM signal can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to J7516.
- VREFCM voltage should be about 780 mV (continuous voltage).

3.2.3.1 Hinku (N7500) RB_EXT voltage ok?

- GSM receiver has to be active before Hinku’s RB_EXT voltage can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7504.

- RB_EXT voltage should be 1.325 – 1.375 V.

3.2.3.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.2.3.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

Remember to solder a new component to R7503 pads after measurement.

3.2.3.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.2.3.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

3.2.3.1.1.2 Retu ok?

3.2.3.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R521 and R504 resistance values with an ohmmeter.

3.2.3.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.2.3.1.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

3.2.3.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not

help go to the next step.

3.2.3.1.3.3 Replace Hinku (N7500) or Vinku (N7501) or both

3.2.3.1.4 Replace Hinku (N7500)

3.2.3.2 Replace Hinku (N7500)

- Also RAP3G can be faulty but it's not possible to replace this component

3.2.4 RAP3G faulty?

- Not possible to replace!

3.3 GSM Transmitter phase error ok?

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting". Change TX data type to "Random" in Phoenix.
- Measurement can be done with a GSM transmitter tester or other GSM communication tester. Trigger to TX burst midamble should be used.
- Attach the phone to the product specific test jig and the RF-measurement device to the RF-coupler. Coupler attenuation should be also taken into account during measurements.
- The RMS Phase error shall not be greater than 5° and the peak phase error not greater than 20°.
- If phase error is not as expected separate the phone into parts and place to the module jig (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).

3.3.1 Are capacitors in Vinku REG1 and REG2 lines in place?

C7554, C7555 and C7547 (GSM1800 and GSM1900: also C7552)

- Check that components are in place and solder joints are ok

3.3.2 Are capacitors in GSM PA power supply line in place?

- C7569 and C7583
- Check that component is in place and solder joints are ok

3.3.3 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3 "ST_CDSP_TX_IQ_TEST" these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

3.3.4 Is TX VCO signal level in the T7503 output high enough?

- GSM transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".

- Measurements can be done with a spectrum analyser and an RF probe. RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.

- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines during GSM TX burst. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.3.4.1 TX VCO G7502 output level high enough?

- GSM transmitter has to be active before TX VCO’s output frequency and output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.

- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).

- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.

- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm during GSM TX burst.

3.3.4.1.1 Replace TX VCO G7502

3.3.4.2 Replace balun T7503

3.3.5 VCTCXO frequency and output level correct?

- Measurement can be done with an oscilloscope and a probe.

- Connect the probe to C7529 (or C7582)

- The frequency of the VCTCXO should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCXO output signal is presented in figure 6.5.1 "VCTCXO Output (DC Offset 1.24 V)".

3.3.5.1 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe

- Connect the probe to C7560 (or C7526, C7513)

- VXO-voltage should be about 2.5 V

3.3.5.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

3.3.5.1.2 Replace Retu

3.3.5.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCXO (G7501) or all three components

3.3.5.2 BB AFC-voltage ok?

- See section "BB AFC-voltage ok?"

3.3.5.3 Replace VCTCXO G7501

3.4 GSM (GMSK) modulation spectrum ok?

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with a GSM transmitter tester or other GSM communication tester. Settings have to be done according to the 3GPP specifications. Modulation spectrum measurement is possible to perform also with a spectrum analyser, but in this case measurement settings have to be done manually.
- Attach the phone to the product specific test jig and the RF-test device to the RF-coupler. Coupler attenuation should be also taken into account during measurements.

- Set TX Data Type to “Random” in Phoenix
- Enter correct “Centre frequency” to the spectrum analyser (see section “Frequency mappings”) and “Span” should be set to 2 MHz. “RBW” and “VBW” should be set to 30 kHz.
- Select a correct attenuator in the spectrum analyser and set “reference level offset” according attenuation between the phone and the spectrum analyser.
- Enter “Sweep time” at least to 2.5 s.
- Check that the TX power is not over the specification limits in following offsets (tables below). If the measurement is performed with a spectrum analyser according above settings then there may be 1 to 3 dB exceeding with some limit values. This is caused because above settings are meant only for fast modulation spectrum checking and are not exactly done according 3GPP specification.

  EGSM900/GSM1800:

Offset (kHz)	100	200	250	400	≥ 600 < 1 800
Limit (dBc)	+0,5	-30	-33	-60	-60

GSM1900:

Offset (kHz)	100	200	250	400	600 < 1 200	1 200 < 1 800
Limit (dBc)	+0,5	-30	-33	-60	-60	-60

One example of measured GSM Modulation Spectrum in EGSM900 band is presented in figure 6.5.8 "TX Modulation spectrum (GSM)"..

- If modulation spectrum is not as expected separate the phone into parts and place to the module jig (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).

3.4.1 Are components in GSM power control loop in place and working ok?

R7516 and C7559

- Disconnect the power supply from the phone and use an ohmmeter to check that C7559 is not short-circuited. If short-circuit is found replace the capacitor. Check R7516 resistance value with an ohmmeter and replace resistor if needed.

3.4.2 Does GSM PA (N7502) get correct bias currents? Is the level of bias currents ok?

EGSM: Icont_21 and Icont_22
GSM1800/GSM1900: Icont_31 and Icont_32

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the maximum (“5” in EGSM900 and “0” in GSM1800/GSM1900)
- Measurements can be done with an oscilloscope and a VOLTAGE probe.
- EGSM900:

- Connect the probe to C7545 or C7544. Notice: C7544 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB
- Typical full TX power bias currents (Icont_21 and Icont_22) should look somehow similar to figure 6.5.4 “Icont_21/Icont_22 (DC Offset 1.2 V)”, when measured with an oscilloscope and a probe. Check both currents.

- GSM1800 or GSM1900:

- Connect the probe to C7561 or C7556. Notice: C7556 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB

Typical full TX power bias currents (Icont_31 and Icont_32) should look somehow similar to figure 6.5.5 "Icont_31/Icont_32 (DC Offset 1.2 V)" when measured with an oscilloscope and a probe. Check both currents.

3.4.2.1 Vinku (N7501) RB_EXT voltage ok?

- See section "Vinku (N7501) RB_EXT voltage ok?"

3.4.2.2 Are capacitors in GSM PA (N7502) bias lines working correctly?

EGSM: Icont_21 missing – Replace Vinku
Icont_22 missing – C7545 short-circuited?
GSM1800/GSM1900: Icont_31 missing – C7556 short-circuited?
Icont_32 missing – C7561 short-circuited?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.4.2.3 Replace Vinku (N7501)

3.4.3 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3 "ST_CDSP_TX_IQ_TEST" these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

3.4.4 Is TX VCO signal level in the T7503 output high enough?

- GSM transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines during GSM TX burst. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.4.4.1 TX VCO G7502 output level high enough?

- GSM transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").

- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm during GSM TX burst.

3.4.4.1.1 Replace TX VCO G7502

3.4.4.2 Replace balun T7503

3.4.5 Replace Vinku (N7501) or GSM PA (N7502) or both

3.5 TX power vs. time ok?

This section means situation when GSM TX power levels are ok, but burst timing is not correct or power changes during TX burst.

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”. ***Note!*** *It is probably needed to change the Tx Data Type in Phoenix to “Random” before this measurement can be performed.*
- Measurement can be done with a GSM transmitter tester or other GSM communication tester. Attach the phone to the product specific test jig and the measurement device to the RF-coupler. Coupler attenuation should be also taken into account during measurements.
- If TX power vs. time is not as expected separate the phone into parts and place to the module jig (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).

3.5.1 Is the TXC-signal coming to Vinku ASIC (N7501) OK?

- GSM transmitter has to be active before TX control voltage TXC can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level first to the maximum (“5” in EGSM900 and “0” in GSM1800/GSM1900)
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7549
- Typical TX control voltage TXC timing should look somehow similar to figure 6.5.2 "TXC in GSM mode (DC Offset 0 V)" (EGSM900 TX power level 5) and voltage levels should be roughly:

- EGSM900: 1.8 V while TX burst and 0 V otherwise.
- GSM1800/GSM1900: 1.8 V while TX burst and 0 V otherwise.

- Change the TX to the minimum power level ("19" in EGSM and "15" in GSM1800/GSM1900)
- Typical TX control voltage TXC levels should be now about:
- EGSM900: 1.0 V while TX burst and 0 V otherwise.
- GSM1800/GSM1900: 0.7 V while TX burst and 0 V otherwise.

3.5.1.1 R7514 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R514 resistance value with an ohmmeter

3.5.1.2 C7549 working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check with an ohmmeter that C7549 is not short-circuited.

3.5.1.3 Retu ok?

3.5.2 Does GSM PA (N7502) get correct bias currents? Is the level of bias currents ok?

EGSM: Icont_21 and Icont_22
GSM1800/GSM1900: Icont_31 and Icont_32

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to the maximum ("5" in EGSM900 and "0" in GSM1800/GSM1900)
- Measurements can be done with an oscilloscope and a VOLTAGE probe.
- EGSM900:
- Connect the probe to C7545 or C7544. Notice: C7544 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB
- Typical full TX power bias currents (Icont_21 and Icont_22) should look somehow similar to figure 6.5.4 "Icont_21/Icont_22 (DC Offset 1.2 V)" when measured with an oscilloscope and a probe. Check both currents.
- GSM1800 or GSM1900:
- Connect the probe to C7561 or C7556. Notice: C7556 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB
- Typical full TX power bias currents (Icont_31 and Icont_32) should look somehow similar to figure 6.5.5 "Icont_31/Icont_32 (DC Offset 1.2 V)" when measured with an oscilloscope and a probe. Check both currents.

3.5.2.1 Vinku (N7501) RB_EXT voltage ok?

- See section "Vinku (N7501) RB_EXT voltage ok?"

3.5.2.2 Are capacitors in GSM PA (N7502) bias lines working correctly?

EGSM: Icont_21 missing – Replace Vinku
Icont_22 missing – C7545 short-circuited?
GSM1800/GSM1900: Icont_31 missing – C7556 short-circuited?
Icont_32 missing – C7561 short-circuited?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.5.2.3 Replace Vinku (N7501)

3.5.3 Does GSM PA (N7502) get correct DET_SW_G -voltage from Vinku ASIC (N7501)?

- GSM transmitter has to be active before DET_SW_G voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7595. Notice: C7595 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.
- DET_SW_G voltage should be about 2.8 V while TX burst and 0 V otherwise.

3.5.3.1 Replace Vinku (N7501)

3.5.4 Are components in GSM power control loop in place and working ok?

R7516 and C7559

- Disconnect the power supply from the phone and use an ohmmeter to check that C7559 is not short-circuited. If short-circuit is found replace the capacitor.
- Check R7516 resistance value with an ohmmeter and replace resistor if needed.

4. DOES THE PHONE REGISTER TO THE NETWORK AND MAKE A CALL (WCDMA)?

- Test against a WCDMA communication tester or real WCDMA network with a proper SIM.

4.1 WCDMA TX power and transmit frequency ok?

- Attach the phone to the product specific test jig and a spectrum analyser to the RF-coupler. Coupler attenuation should be also taken into account during measurements. This measurement should be done in an RF shielded box.

- Close the shield box hatch.

- Set WCDMA TX ON. Procedure is explained in section “Transmitter troubleshooting”.

- Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).

- Spectrum analyser RBW = VBW = 10 MHz, Span ≤ 2 MHz, sweep time 100 ms.

- Test at power level 21 dBm

- The output power should be +17 – +23 dBm, typical value 21 dBm.

- Remember to select “Stop RF” in Phoenix before opening the shield box hatch.

- If power is not as expected separate the phone into parts and place to the module jig. Connect a spectrum analyser to the module jig WCDMA RF connector and measure TX power again (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).

- TX power ok in the module jig: Antenna or antenna connection bad. Replace the antenna

- TX power still wrong or no TX signal found at all: Continue troubleshooting

- If TX signal is not found at all use wider span setting and check if the transmitter is transmitting on wrong frequency. If signal is found to be on wrong frequency, see section, 4.1.3."WCDMA transmitter frequency correct?".

4.1.1 Does the WCDMA TX transmit RF-power at all?

- If TX signal is not found at all use wider span setting and check if the transmitter is transmitting on wrong frequency. If signal is found to be on wrong frequency, see section 4.1.3. "WCDMA transmitter frequency correct?".

4.1.1.1 Is Vinku (N7501) transmitting RF-power at all?

- WCDMA transmitter has to be active before Vinku’s output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.

- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).

- Spectrum analyser RBW = VBW = 10 MHz, Span ≤ 2 MHz, sweep time 100 ms.

- Connect the RF probe to R7520. The RF-level should be about the same on both ends of the resistor. Check output level with 0 dBm power level (Set start level “0” to Phoenix).

- Power level “0” – Output level should be about -40…-48 dBm

4.1.1.1.1 RF operating voltage VBAT_ASIC ok?

- See section “RF operating voltage VBAT_ASIC ok?”

4.1.1.1.2 RFBUS signals ok?

- GSM receiver has to be active before RFBUS signals can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”. Also WCDMA/GSM transmitter and WCDMA receiver activation can be used for the measurement but then RFBUS -signals don’t necessarily look like in figures mentioned below.

- Measurements can be performed with an oscilloscope and a probe. Check all five RF BUS signals:

- *RFBUSDAT*: Connect the probe to J7504. Typical RFBUSDAT -signal is shown in section 6.5.9.3 “RFBUSDAT (GSM RX)”

- *RFBUSCLK*: Connect the probe to J7505. Typical RFBUSCLK -signal is shown in sections 6.5.9.1 “RFBUSCLK (GSM RX)” and 6.5.9.2 “RFBUSCLK and RFBUSENA (GSM RX)”

- *RFBUSENA*: Connect the probe to J7506. Typical RFBUSENA -signal is shown in section 6.5.9.2 “RFBUSCLK and RFBUSENA (GSM RX)”

- *RXRESETX*: Connect the probe to J7515. RXRESETX -signal is a constant 2 V DC-signal after GSM or WCDMA transceiver has been activated the first time after phone boot up. The level of this signal should be about 0 V before transceiver activation.

- *TXRESETX*: Connect the probe to J7517. TXRESETX -signal is a constant 2 V DC-signal after GSM or WCDMA transceiver has been activated the first time after phone boot up. The level of this signal should be about 0 V before transceiver activation.

4.1.1.1.2.1 RAP3G (or Vinku or Hinku) faulty?

- RAP3G (D2800) cannot be replaced.

4.1.1.1.3 Vinku (N7501) regulator voltages VREG1, VREG2 ok?

- WCDMA transmitter has to be active before VREG1 and VREG2 voltages can be measured. Procedure is explained in section “Transmitter troubleshooting”.

- Measurements can be done with an oscilloscope and a probe.

- VREG1: Connect the probe to C7543

- VREG2: Connect the probe to C7548 (or C7547)

- VREG1 and VREG2 voltage levels should be 2.65 – 2.86 V. Typical value is 2.7 V.

4.1.1.1.3.1 Vinku (N7501) RB_EXT voltage ok?

- WCDMA transmitter has to be active before Vinku’s RB_EXT voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7521.
- RB_EXT voltage should be 1.325 – 1.375 V.

4.1.1.1.3.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.1.1.3.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

- Remember to solder a new component to R7503 pads after measurement.

4.1.1.1.3.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.1.1.3.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.1.1.3.1.1.2 Retu ok?

4.1.1.1.3.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

4.1.1.1.3.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.1.1.3.1.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

4.1.1.1.3.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.1.1.3.1.3.3 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.1.1.3.1.4 Replace Vinku (N7501)

4.1.1.1.3.2 Are capacitors in Vinku (N7501) regulator lines working correctly?

VREG1: C7543

VREG2: C7547, C7548, C7554, C7555, C7553, C7552, C7558 and C7567

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that regulator lines are not short-circuited to the ground. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.1.1.3.3 TX VCO (G7502) ok?

4.1.1.1.3.4 Replace Vinku (N7501)

4.1.1.1.4 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513)
- VXO-voltage should be about 2.5 V

4.1.1.1.4.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

4.1.1.1.4.2 Replace Retu

4.1.1.1.4.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCXO (G7501) or all three components

4.1.1.1.5 VCP2-voltage ok?

- WCDMA transmitter has to be active before VCP2 voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C2221 (or C7550).
- VCP2 voltage should be about 4.75 V.

4.1.1.1.5.1 C7550 short-circuited?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that C7550 is not short-circuited. If short-circuit is found replace the capacitor mentioned above. If this does not help go to the next step.

4.1.1.1.5.2 Retu ok?

4.1.1.1.5.3 Vinku (N7501) ok?

4.1.1.1.6 Is there RF power in the TX VCO output at all?

- WCDMA transmitter has to be active before TX VCO’s output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing. *Quick VCO alive check can be done without removing the RF shield. The RF probe should be placed as near the TX VCO output as possible (Put the head of the probe carefully inside the VCO can through the holes of the shield). This method can be used only to check that the TX VCO is alive. Remember to use low RF Attenuator value in the spectrum analyser with this method.*
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The correct VCO frequency can be found in see section “Frequency mappings”. The output level of the VCO should be about -25 dBm.

4.1.1.1.6.1 TX VCO operating voltage VREG2 (VR2) ok?

- See section 4.1.1.1.3 “Vinku (N7501) regulator voltages VREG1, VREG2 ok?”

4.1.1.1.6.2 Replace TX VCO (G7502)

4.1.1.1.7 Is TX VCO RF-signal coming to the Vinku at all?

- WCDMA transmitter has to be active before TX VCO’s output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW

and VBW = 1 MHz, Span ≤ 200 kHz.

- Check the level of the TX VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

4.1.1.1.7.1 Replace balun T7503

4.1.1.1.8 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3. "ST_CDSP_TX_IQ_TEST" these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

4.1.1.1.9 Is the TXC-signal coming to Vinku ASIC (N7501) OK?

- WCDMA transmitter has to be active before TX control voltage TXC can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to -50 dBm (Set start level "-50" to Phoenix)
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7549
- TX control voltage TXC should be constant DC-voltage between 0.1 - 2.3 V. Voltage level should change if TX power is changed. TXC is lower on lower power levels and higher if higher power levels are used.
- TXC voltage should be about 1.0 V with power level -50 dBm and about 1.5 V with power level 0 dBm.

4.1.1.1.9.1 R7514 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7514 resistance value with an ohmmeter

4.1.1.1.9.2 C7549 working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that C7549 is not short-circuited.

4.1.1.1.9.3 Retu ok?

4.1.1.1.10 WCDMA-modulator supply voltage (VREG2) ok?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7520
- DC voltage level should be 2.65 – 2.86 V in both R7520 pads. Typical value is 2.7 V.

4.1.1.1.10.1 Inductors L7512 and L7510 in place and working correctly?

- Disconnect the power supply from the phone and use an ohmmeter to check that L7510 and L7512 are conducting DC.

4.1.1.1.11 VCTCXO frequency and output level ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCXO should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCXO output signal is presented in figure 6.5.1 "VCTCXO Output (DC Offset 1.24 V)".

4.1.1.1.11.1 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513)
- VXO-voltage should be about 2.5 V

4.1.1.1.11.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

4.1.1.1.11.1.2 Replace Retu

4.1.1.1.11.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCXO (G7501) or all three components

4.1.1.1.11.2 BB AFC-voltage ok?

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to R7509 (or C7533)
- AFC-voltage may vary between 0.1 - 2.3 V. Typical value is 1.2 V. Phoenix “RF Controls” tool can be used to change the AFC value. Voltage level should be about 0.1 V with AFC value -1024 and about 2.3 V with AFC value 1023.

4.1.1.1.11.2.1 Low pass filter components R7509 and C7533 ok?

- Check that components are in place and solder joints are ok

- Disconnect the power supply from the phone and check R7509 resistance value with an ohmmeter.

- Use an ohmmeter to find out also if the AFC-line is short-circuited to the ground. If short-circuit is found replace C7533. If this does not help then go to the next steps.

4.1.1.1.11.2.2 VCTCXO ok?

- Remove R7509. If AFC-voltage is correct after removing then replace faulty VCTCXO G7501 and solder R7509 (new component) back to the PWB

4.1.1.1.11.2.3 Replace Retu

4.1.1.1.11.3 Replace VCTCXO G7501

4.1.1.1.12 Replace Vinku (N7501)

4.1.1.2 Is there RF-power in the WCDMA PA (N7503) input at all?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.

- Set TX power level to 0 dBm (Set start level “0” to Phoenix)

- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency setting to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).

- Spectrum analyser RBW = VBW = 10 MHz, Span ≤ 2 MHz, sweep time 100 ms

- Connect the probe to Z7506 output. The RF level should be roughly -40…-48 dBm.

4.1.1.2.1 Is Vinku (N7501) output RF-signal coming correctly to the Z7506 (SAW filter)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.

- Set TX power level to 0 dBm (Set start level “0” to Phoenix)

- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).

- Spectrum analyser RBW = VBW = 10 MHz, Span ≤ 2 MHz, sweep time 100 ms

- Connect the RF probe to L7511. The RF-level should be about the same on both ends of the inductor. Check the level with 0 dBm power level (Set start level “0” to Phoenix).

- Power level “0” – Vinku output level should be about -40…-48 dBm

4.1.1.2.1.1 Inductor L7511 and resistor R7520 in place and working correctly?

- Check that components are in place and solder joints are ok

- Disconnect the power supply from the phone and check R7520 resistance value with an ohmmeter.

- If resistance of R7520 is correct then replace L7511.

4.1.1.3 Is WCDMA PA (N7503) transmitting RF-power at all?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to 0 dBm (Set start level “0” to Phoenix)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency setting to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW = VBW = 10 MHz, Span ≤ 2 MHz, sweep time 100 ms
- Connect the probe to Z7505 input. The RF level should be roughly -16…-28 dBm.

4.1.1.3.1 Does WCDMA PA (N7503) get operating voltage Vcc12?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7525
- Vcc12 voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.1.3.1.1 R7525 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7525 resistance value with an ohmmeter

4.1.1.3.1.2 PA operating voltage VBAT_PA ok?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.1.3.1.2.1 Ferrite Z7500 ok?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

4.1.1.3.2 Does WCDMA PA (N7503) get operating voltage Vcc11?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to -40 dBm (Set start level to “-40.0” in Phoenix)
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7580.
- Vcc11 voltage level should be about 1.5 V. The same voltage level should be measured also with all power levels smaller than about 10 dBm. Vcc11 is about 3.3 V with the highest power (21 dBm). NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.1.1.3.2.1 L7515, C7589 and C7580 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that L7515 is conducting DC.
- Use an ohmmeter also to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above.

4.1.1.3.2.2 Does SMPS N7504 get operating voltage Vdd (=VBAT_PA)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- VBAT_PA voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.1.3.2.3 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.
- Voltage level should be about 2.78 V.

4.1.1.3.2.3.1 Replace Vinku (N7501)

4.1.1.3.2.4 Does SMPS get correct control voltage from the WCDMA power detector (signal Vcontrol)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7591.
- Vcontrol signal should be constant DC-voltage. Voltage level should change if TX power is changed. Vcontrol is lower on lower power levels and higher if higher power levels are used.
- Vcontrol should be about 570 mV with power level +10 dBm, about 2.0 V with power level +21 dBm and about 200 mV when power levels below 0 dBm are used. NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.1.1.3.2.4.1 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.
- Voltage level should be about 2.78 V.

4.1.1.3.2.4.1.1 Replace Vinku (N7501)

4.1.1.3.2.4.2 Check WCDMA power detector components – In place and value correct?

Components L7514, C7585, V7500, R7526, C7586, R7527, C7587, C7590, R7529, R7530, C7591, R7531 and C7592.

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter
- Use an ohmmeter also to check that L7514 is conducting DC.

4.1.1.3.2.5 Replace SMPS N7504

4.1.1.3.3 Does WCDMA PA (N7503) get bias currents Icont11 and Icont12?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to -40 dBm (Set start level to “-40.0” in phoenix)
- Measurements can be done with an oscilloscope and a probe.

- Connect the probe to C7579
- WCDMA PA bias current Icont_12 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.
- Connect the probe to C7576 pad. Notice: C7576 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.
- WCDMA PA bias current Icont_11 should look as a constant 2.5 - 2.6 V DC-voltage with all power

levels.

4.1.1.3.3.1 Vinku (N7501) RB_EXT voltage ok?

- WCDMA transmitter has to be active before Vinku's RB_EXT voltage can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7521.
- RB_EXT voltage should be 1.325 – 1.375 V.

4.1.1.3.3.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.1.3.3.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

- Remember to solder a new component to R7503 pads after measurement.

4.1.1.3.3.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.1.3.3.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.1.3.3.1.1.2 Retu ok?

4.1.1.3.3.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

4.1.1.3.3.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.1.3.3.1.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

4.1.1.3.3.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.1.3.3.1.3.3 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.1.3.3.1.4 Replace Vinku (N7501)

4.1.1.3.3.2 Is capacitor C7579 in WCDMA PA (N7503) bias line working correctly?

Icont_12 missing – C7579 short-circuited?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that the capacitor is not short-circuited. If short-circuit is found replace the capacitor. If this does not help go to the next step.

4.1.1.3.3.3 Replace Vinku (N7501) or WCDMA PA (N7503)

4.1.1.3.4 Replace PA (N7503)

4.1.1.4 Does duplex-filter (Z7502) get correct RF-power level from WCDMA PA (N7503)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to 0 dBm (Set start level “0” to Phoenix)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency setting to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW = VBW = 10 MHz, Span ≤ 2 MHz, sweep time 100 ms
- Connect the probe to Z7502 TX input. The RF level should be roughly -20…-30 dBm.

4.1.1.4.1 Replace isolator Z7505

4.1.1.5 Replace duplex-filter Z7502

4.1.2 Does WCDMA TX transmit enough RF-power and power levels otherwise ok?

4.1.2.1 Is Vinku ASIC (N7501) transmitting correct RF-power?

- WCDMA transmitter has to be active before Vinku’s output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.

- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser RBW = VBW = 10 MHz, Span ≤ 2 MHz, sweep time 100 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).

- Connect the RF probe to R7520. The RF-level should be about the same on both ends of the resistor. Check output level with 0 dBm (“0”) power level.

- Power level (“0”) – Output level should be about -45...-48 dBm

- Check if output levels of Vinku are as expected.

4.1.2.1.1 RF operating voltage VBAT_ASIC ok?

- See section “RF operating voltage VBAT_ASIC ok?”

4.1.2.1.2 Vinku (N7501) regulator voltages VREG1, VREG2 ok?

- WCDMA transmitter has to be active before VREG1 and VREG2 voltages can be measured. Procedure is explained in section “Transmitter troubleshooting”. Measurements can be done with an oscilloscope and a probe.

- VREG1: Connect the probe to C7543

- VREG2: Connect the probe to C7548 (or C7547)

- VREG1 and VREG2 voltage levels should be 2.65 – 2.86 V. Typical value is 2.7 V.

4.1.2.1.2.1 Vinku (N7501) RB_EXT voltage ok?

- WCDMA transmitter has to be active before Vinku’s RB_EXT voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.

- Measurement can be done with an oscilloscope and a probe.

- Connect the probe to R7521.

- RB_EXT voltage should be 1.325 – 1.375 V.

4.1.2.1.2.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.

- Connect the probe to R7503.

- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.2.1.2.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

- Remember to solder a new component to R7503 pads after measurement.

4.1.2.1.2.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.2.1.2.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.2.1.2.1.1.2 Retu ok?

4.1.2.1.2.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

4.1.2.1.2.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.2.1.2.1.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

4.1.2.1.2.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.2.1.2.1.3.3 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.2.1.2.2 Replace Vinku (N7501)

4.1.2.1.3 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3 “ST_CDSP_TX_IQ_TEST” these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

4.1.2.1.4 Is the TXC-signal coming to Vinku ASIC (N7501) OK? Is signal level correct?

- WCDMA transmitter has to be active before TX control voltage TXC can be measured. Procedure is explained in section “Transmitter troubleshooting”.

- Set TX power level to -50 dBm (Set start level "-50" to Phoenix)
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7549
- TX control voltage TXC should be constant DC-voltage between 0.1 - 2.3 V. Voltage level should change if TX power is changed. TXC is lower on lower power levels and higher if higher power levels are used.
- TXC voltage should be about 1.0 V with power level -50 dBm and about 1.5 V with power level 0 dBm.

4.1.2.1.4.1 R7514 resistance value correct?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7514 resistance value with an ohmmeter

4.1.2.1.4.2 C7549 ok?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that C7549 is not short-circuited.

4.1.2.1.4.3 Retu ok?

4.1.2.1.5 Does Vinku (N7501) WCDMA-modulator get correct supply voltage (VREG2)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7520
- DC voltage level should be 2.65 – 2.86 V in both R7520 pads. Typical value is 2.7 V.

4.1.2.1.5.1 Inductors L7512 and L7510 in place and working correctly?

- Disconnect the power supply from the phone and use an ohmmeter to check that L7510 and L7512 are conducting DC.

4.1.2.1.6 Is TX VCO signal level in the T7503 output high enough?

- WCDMA transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW

and VBW = 1 MHz, Span ≤ 200 kHz.

- Check the level of the VCO frequency in T7503 outputs. The level should be about -30…-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

4.1.2.1.6.1 TX VCO G7502 output level high enough?

- WCDMA transmitter has to be active before TX VCO’s output frequency and output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm.

4.1.2.1.6.1.1 Replace TX VCO G7502

4.1.2.1.6.2 Replace balun T7503

4.1.2.1.7 Replace Vinku (N7501)

4.1.2.2 Is there correct RF-power in the WCDMA PA (N7503) input?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to 0 dBm (Set start level “0” to Phoenix)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency setting to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW = VBW = 10 MHz, Span ≤ 2 MHz, sweep time 100 ms.
- Connect the probe to Z7506 output. The RF level should be roughly -40…-48 dBm.

4.1.2.2.1 Is Vinku (N7501) output RF-signal coming correctly to the Z7506 (SAW filter)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to 0 dBm (Set start level “0” to Phoenix)
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).

- Spectrum analyser RBW = VBW = 10 MHz, Span ≤ 2 MHz, sweep time 100 ms.
- Connect the RF probe to L7511. The RF-level should be about the same on both ends of the inductor. Check the level with 0 dBm power level (Set start level “0” to Phoenix).
- Power level “0” – Vinku output level should be about -40…-48 dBm

4.1.2.2.1.1 Inductor L7511 and resistor R7520 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7520 resistance value with an ohmmeter.
- If resistance of R7520 is correct then replace L7511.

4.1.2.3 Does WCDMA PA (N7503) transmit correct RF-power?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to 0 dBm (Set start level “0” to Phoenix)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency setting to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW = VBW = 10 MHz, Span ≤ 2 MHz, sweep time 100 ms.
- Connect the probe to Z7505 input. The RF level should be roughly -16…-28 dBm.

4.1.2.3.1 Does WCDMA PA (N7503) get correct operating voltage Vcc12?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7525
- Vcc12 voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.2.3.1.1 R7525 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7525 resistance value with an ohmmeter

4.1.2.3.1.2 PA operating voltage VBAT_PA ok?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.2.3.1.2.1 Ferrite Z7500 ok?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

4.1.2.3.2 Does WCDMA PA (N7503) get correct operating voltage Vcc11?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to -40 dBm (Set start level to “-40.0” in Phoenix)
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7580.
- Vcc11 voltage level should be about 1.5 V. The same voltage level should be measured also with all power levels smaller than about 10 dBm. Vcc11 is about 3.3 V with the highest power (21 dBm). NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.1.2.3.2.1 L7515, C7589 and C7580 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that L7515 is conducting DC.
- Use an ohmmeter also to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above.

4.1.2.3.2.2 Does SMPS N7504 get operating voltage Vdd (=VBAT_PA)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- VBAT_PA voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.2.3.2.3 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.

- Voltage level should be about 2.78 V.

4.1.2.3.2.3.1 Replace Vinku (N7501)

4.1.2.3.2.4 Does SMPS get correct control voltage from the WCDMA power detector (signal Vcontrol)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7591.
- Vcontrol signal should be constant DC-voltage. Voltage level should change if TX power is changed. Vcontrol is lower on lower power levels and higher if higher power levels are used.
- Vcontrol should be about 570 mV with power level +10 dBm, about 2.0 V with power level +21 dBm and about 200 mV when power levels below 0 dBm are used. NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.1.2.3.2.4.1 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.
- Voltage level should be about 2.78 V.

4.1.2.3.2.4.1.1 Replace Vinku (N7501)

4.1.2.3.2.4.2 Check WCDMA power detector components – In place and value correct?

Components L7514, C7585, V7500, R7526, C7586, R7527, C7587, C7590, R7529, R7530, C7591, R7531 and C7592.

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter
- Use an ohmmeter to check that L7514 is conducting DC.
- Use a diode meter to make sure that diodes inside V7500 are working correctly.

4.1.2.3.2.5 Replace SMPS N7504

4.1.2.3.3 Does WCDMA PA (N7503) get bias currents Icont11 and Icont12?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to -40 dBm (Set start level to “-40.0” in phoenix)

- Measurements can be done with an oscilloscope and a probe.
  - Connect the probe to C7579
  - WCDMA PA bias current Icont_12 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.
  - Connect the probe to C7576 pad. Notice: C7576 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.
  - WCDMA PA bias current Icont_11 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.

4.1.2.3.3.1 Vinku (N7501) RB_EXT voltage ok?

- WCDMA transmitter has to be active before Vinku's RB_EXT voltage can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7521.
- RB_EXT voltage should be 1.325 – 1.375 V.

4.1.2.3.3.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.2.3.3.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

- Remember to solder a new component to R7503 pads after measurement.

4.1.2.3.3.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.2.3.3.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.2.3.3.1.1.2 Retu ok?

4.1.2.3.3.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

4.1.2.3.3.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.2.3.3.1.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

4.1.2.3.3.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.2.3.3.1.3.3 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.2.3.3.1.4 Replace Vinku (N7501)

4.1.2.3.3.2 Is capacitor C7579 in WCDMA PA (N7503) bias line working correctly?

Icont_12 – C7579 short-circuited?

- Check that the capacitor is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that the capacitor is not short-circuited. If short-circuit is found replace the capacitor.

4.1.2.3.3.3 Replace Vinku (N7501) or WCDMA PA (N7503)

4.1.2.3.4 Replace PA (N7503)

4.1.2.4 Does duplex-filter (Z7502) get correct RF-power from WCDMA PA (N7503)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to 0 dBm (Set start level “0” to Phoenix)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency setting to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”)
- Spectrum analyser RBW = VBW = 10 MHz, Span ≤ 2 MHz, sweep time 100 ms
- Connect the probe to Z7502 TX input. The RF level should be roughly -20...-30 dBm.

4.1.2.4.1 Replace isolator Z7505

4.1.2.5 Replace duplex-filter Z502

4.1.3 WCDMA transmitter frequency correct?

- Connect a spectrum analyser to the module test jig RF connector.
- Set WCDMA Tx ON. Procedure is explained in section “Transmitter troubleshooting”.
- Check if the frequency of the transmitter is as expected. If output signal is not found try to use 500 MHz span setting.

  The correct TX frequency is shown in Phoenix “Tx Control (WCDMA)” window and can be found also in see section “Frequency mappings”. If the frequency is not found at all then go to 4.1.1”Does the WCDMA TX transmit RF-power at all?”

4.1.3.1 Is TX VCO frequency as expected?

- WCDMA transmitter has to be active before TX VCO’s output frequency and output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing. *Quick VCO alive check can be done without removing the RF shield. The RF probe should be placed as near the TX VCO output as possible (Put the head of the probe carefully inside the VCO can through the holes of the shield). This method can be used only to check that the TX VCO is alive. It won’t expose if the T7503 is broken or the output level of the VCO is too low. Remember to use low RF Attenuator value in the spectrum analyser with this method.*
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm.

4.1.3.1.1 C7543, C7548 and L7517 ok?

- These components should be checked if TX VCO frequency is not stable and TX PLL frequency not locked.
- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

4.1.3.1.2 TX VCO control voltage VC ok?

- WCDMA transmitter has to be active before TX VCO control voltage VC can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.

- Connect the probe to R7519.
- TX VCO control voltage VC should be constant DC-voltage between 0.7 - 3.8 V. DC voltage level should change if TX channel is changed. VC is lower on lower channels and higher if higher channel numbers are used.

4.1.3.1.2.1 VCP2-voltage ok?

- WCDMA transmitter has to be active before VCP2 voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C2221 (or C7550).
- VCP2 voltage should be about 4.75 V.

4.1.3.1.2.1.1 C7550 short-circuited?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that C7550 is not short-circuited. If short-circuit is found replace the capacitor mentioned above. If this does not help go to the next step.

4.1.3.1.2.1.2 Retu ok?

4.1.3.1.2.1.3 Vinku (N7501) ok?

4.1.3.1.2.2 Vinku (N7501) RB_EXT voltage ok?

- WCDMA transmitter has to be active before Vinku’s RB_EXT voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7521.
- RB_EXT voltage should be 1.325 – 1.375 V.

4.1.3.1.2.2.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.3.1.2.2.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

- Remember to solder a new component to R7503 pads after measurement.

4.1.3.1.2.2.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.3.1.2.2.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.3.1.2.2.1.2 Retu ok?

4.1.3.1.2.2.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

4.1.3.1.2.2.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.3.1.2.2.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

4.1.3.1.2.2.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.3.1.2.2.3.3 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.3.1.2.2.4 Replace Vinku (N7501)

4.1.3.1.2.3 Balun T7503 ok?

- WCDMA transmitter has to be active before TX VCO’s output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Check the level of the TX VCO frequency in T7503 outputs. The level should be about -30…-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level

is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

4.1.3.1.2.4 Are components near the TX VCO ok?

C7571, R7519, R7523, C7573 and C7568 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter.
- Use an ohmmeter to check also that capacitors are not short-circuited

4.1.3.1.2.5 Replace Vinku (N7501) or TX VCO (G7502) or both

4.1.3.1.3 Replace TX VCO G7502

4.1.3.2 Is TX VCO signal level in the T7503 output high enough?

- WCDMA transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

4.1.3.2.1 TX VCO G7502 output level high enough?

- WCDMA transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm.

4.1.3.2.1.1 Replace TX VCO G7502

4.1.3.2.2 Replace balun T7503

4.1.3.3 VCTCXO frequency and output level ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCXO should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCXO output signal is presented in figure 6.5.1 "VCTCXO Output (DC Offset 1.24V)".

4.1.3.3.1 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513)
- VXO-voltage should be about 2.5 V

4.1.3.3.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

4.1.3.3.1.2 Replace Retu

4.1.3.3.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCXO (G7501) or all three components

4.1.3.3.2 BB AFC-voltage ok?

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to R7509 (or C7533)
- AFC-voltage may vary between 0.1 - 2.3 V. Typical value is 1.2 V. Phoenix “RF Controls” tool can be used to change the AFC value. Voltage level should be about 0.1 V with AFC value -1024 and about 2.3 V with AFC value 1023.

4.1.3.3.2.1 Low pass filter components R7509 and C7533 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7509 resistance value with an ohmmeter.
- Use an ohmmeter to find out also if the AFC-line is short-circuited to the ground. If short-circuit is found replace C7533. If this does not help then go to the next steps.

4.1.3.3.2.2 VCTCXO ok?

- Remove R7509. If AFC-voltage is correct after removing then replace faulty VCTCXO G7501 and solder R7509 (new component) back to the PWB

4.1.3.3.2.3 Replace Retu

4.1.3.3.3 Replace VCTCXO G7501

4.2 Does the phone give realistic RSSI-values?

Attach the phone to the product specific test jig and a signal generator to the RF-coupler. Coupler attenuation should be also taken into account during measurements.

Use the signal generator to supply -90 dBm RF-level to the phone via the antenna coupler. Set generator RF-level to -90 dBm + Cable and coupler attenuation. This measurement should be performed in a RF-shielded environment because existing WCDMA-network base stations can disturb this measurement otherwise.

- Set RF-generator frequency to 2141.0 MHz (unmodulated signal).
- Use Phoenix testing & tuning software to perform WCDMA receiver activation and RSSI measurement for channel 10700. Procedure is explained in sections “WCDMA RX chain activation for manual measurement” and “WCDMA RSSI measurement”.
- “Rx Power Measurement” tool should show quite exact -90 dBm RSSI level. Remember to take into account attenuation between the phone and signal generator.
- Increase signal generator RF level to -60 dBm. Phoenix ”Rx Power Measurement” tool should show now quite exact RSSI level -60 dBm.
- If RSSI-levels are not as expected separate the phone into parts and place to the module jig. Connect the signal generator to the module jig WCDMA RF connector (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).

4.2.1 Is Hinku ASIC (N7500) receiving RF-power correctly from the WCDMA-antenna connector?

- WCDMA receiver has to be active before measurements. Procedure is explained in section “Receiver troubleshooting”.
- Connect an RF-generator to the WCDMA-antenna connector
- Set RF-generator frequency to 2141.0 MHz (unmodulated signal)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser (Centre frequency should be set to the same frequency as the RF-generator). RBW = VBW = 10 kHz, Span = 0, sweep time = 100 ms.
- Connect the probe to T7500 output. There are two output pins because of balanced output. The RF level should be roughly -85...-90 dBm in both output pads when input signal level in WCDMA antenna connector is -50 dBm.

4.2.1.1 Does duplex-filter (Z7502) work properly?

- WCDMA receiver has to be active before measurements. Procedure is explained in section

"Receiver troubleshooting".

- Connect an RF-generator to the WCDMA-antenna connector
- Set RF-generator frequency to 2141.0 MHz (unmodulated signal)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser (Centre frequency should be set to the same frequency as the RF-generator). RBW = VBW = 10 kHz, Span = 0, sweep time = 100 ms.
- Connect the probe to the T7500 input. The RF level should be roughly -80...-85 dBm in the input pad when input signal level in WCDMA antenna connector is -50 dBm.

4.2.1.1.1 Replace filter Z7502

4.2.1.2 Replace balun T7500

4.2.2 Hinku WCDMA LNA output ok?

- WCDMA receiver has to be active before measurements. Procedure is explained in section "Receiver troubleshooting".
- Connect an RF-generator to the WCDMA-antenna connector
- Set RF-generator frequency to 2141.0 MHz (unmodulated signal)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser (Centre frequency should be set to the same frequency as the RF-generator). RBW = VBW = 10 kHz, Span = 0, sweep time = 100 ms.
- Connect the probe to the Z7501 input. The RF level should be roughly -65...-70 dBm in both input pads when input signal level in WCDMA antenna connector is -50 dBm.

4.2.2.1 Replace Hinku N7500

4.2.3 WCDMA SAW Z7501 in place and working correctly?

- WCDMA receiver has to be active before measurements. Procedure is explained in section "Receiver troubleshooting".
- Connect an RF-generator to the WCDMA-antenna connector
- Set RF-generator frequency to 2141.0 MHz (unmodulated signal)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser (Centre frequency should be set to the same frequency as the RF-generator). RBW = VBW = 10 kHz, Span = 0, sweep time = 100 ms.
- Connect the probe to the Z7501 output. The RF level should be roughly -70...-75 dBm in both output pads when input signal level in WCDMA antenna connector is -50 dBm.

4.2.3.1 Replace SAW Z7501

4.2.4 Are RX-IQ signal waveforms and levels correct?

- Measurements can be done with an oscilloscope, a probe and signal generator.
- WCDMA receiver has to be active before RX IQ-signals can be measured. Procedure is explained in section "Receiver troubleshooting".
- Apply –50 dBm RF-signal (unmodulated) from a signal generator to the module jig antenna connector and use frequency 2140.0 MHz (Channel 10700)
- Remember to change the correct RX channel also to Phoenix "RX control" window!
- Check RX I and RX Q -signals in following test points:

- RX I (positive): Connect the probe to test point J7508
- RX I (negative): Connect the probe to test point J7509
- RX Q (positive): Connect the probe to test point J7510
- RX Q (negative): Connect the probe to test point J7511

- Signal in all four test points should be about the same. Output should be a sine wave with frequency 100 kHz and amplitude about 650 mV.
- Change the signal generator to frequency 2142.0 MHz (Channel 10710)
- Signal in all four test points should be about the same. Output should be a sine wave with frequency 2.0 MHz and amplitude about 550 mV.

4.2.4.1 RF operating voltage VBAT_ASIC ok?

- See section "RF operating voltage VBAT_ASIC ok?"

4.2.4.2 RFBUS signals ok?

- GSM receiver has to be active before RFBUS signals can be measured. Procedure is explained in section "GSM RX chain activation for manual measurements". Also WCDMA/GSM transmitter and WCDMA receiver activation can be used for the measurement but then RFBUS -signals don't necessarily look like in figures mentioned below.
- Measurements can be performed with an oscilloscope and a probe. Check all five RF BUS signals:

- *RFBUSDAT*: Connect the probe to J7504. Typical RFBUSDAT -signal is shown in section 6.5.9.3 "RFBUSDAT (GSM RX)".
- *RFBUSCLK*: Connect the probe to J7505. Typical RFBUSCLK -signal is shown in figures "RFBUSCLK (GSM RX)" and "RBUSCLK and RFBUSENA (GSM RX)".
- *RFBUSENA*: Connect the probe to J7506. Typical RFBUSENA -signal is shown in the figure "RFBUSCLK and RFBUSENA (GSM RX)".
- *RXRESETX*: Connect the probe to J7515. RXRESETX -signal is a constant 2 V DC-signal after GSM or WCDMA transceiver has been activated the first time after phone boot up. The level of this signal should be about 0 V before transceiver activation.
- *TXRESETX*: Connect the probe to J7517. TXRESETX -signal is a constant 2 V DC-signal after GSM or WCDMA transceiver has been activated the first time after phone boot up. The level of this signal

should be about 0 V before transceiver activation.

4.2.4.2.1 RAP3G (or Vinku or Hinku) faulty?

- RAP3G (D2800) cannot be replaced.

4.2.4.3 Hinku (N7500) regulator voltage VR1 ok?

- WCDMA receiver has to be active before Hinku's VR1 voltage can be measured. Procedure is explained in section "Receiver troubleshooting".
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7504 (or C7505)
- VR1 voltage level should be 2.65 – 2.86 V. Typical value is 2.7 V.

4.2.4.3.1 Hinku (N7500) RB_EXT voltage ok?

- WCDMA receiver has to be active before Hinku's RB_EXT voltage can be measured. Procedure is explained in section "Receiver troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7504.
- RB_EXT voltage should be 1.325 – 1.375 V.

4.2.4.3.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.2.4.3.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

Remember to solder a new component to R7503 pads after measurement.

4.2.4.3.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.2.4.3.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

4.2.4.3.1.1.2 Retu ok?

4.2.4.3.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

4.2.4.3.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.2.4.3.1.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

4.2.4.3.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.2.4.3.1.3.3 Replace Hinku (N7500) or Vinku (N7501) or both

4.2.4.3.1.4 Replace Hinku (N7500)

4.2.4.3.2 Are capacitors in Hinku (N7500) regulator lines working correctly?

C7504, C7515, C7509, C7508, C7596, C7598 and C7505

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.2.4.3.3 RX VCO G7500 ok?

4.2.4.3.4 Replace Hinku (N7500)

4.2.4.4 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513)
- VXO-voltage should be about 2.5 V

4.2.4.4.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

4.2.4.4.2 Replace Retu

4.2.4.4.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCXO (G7501) or all three components

4.2.4.5 VCP1-voltage ok?

- WCDMA receiver has to be active before VCP1 voltage can be measured. Procedure is explained in section "Receiver troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7507.
- VCP1 voltage should be about 4.75 V.

4.2.4.5.1 C7507 and C2222 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors C7507 and C2222 are not short-circuited. If short-circuit is found replace faulty capacitor. If this does not help go to the next steps.

4.2.4.5.2 Retu ok?

4.2.4.5.3 Hinku (N7500) ok?

4.2.4.6 Is there RF power in the RX VCO output at all?

- WCDMA receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section "Receiver troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section "Frequency mappings". RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Connect the RF probe to the T7501 input.
- Check if the frequency of the RX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -20...-30 dBm.

4.2.4.6.1 RX VCO operating voltage VR1 RX ok?

- WCDMA receiver has to be active before Hinku's VR1RX voltage can be measured. Procedure is explained in section "Receiver troubleshooting"

- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7515 (or C7598)
- VR1RX voltage level should be continuous 2.65 - 2.86 V in WCDMA mode. Typical value is 2.7 V.

4.2.4.6.1.1 Hinku (N7500) regulator voltage VR1 ok?

- See section “Hinku (N7500) regulator voltage VR1 ok?”

4.2.4.6.1.2 Replace Hinku (N7500)

4.2.4.6.2 Replace RX VCO (G7500)

4.2.4.7 Is RX VCO RF-signal coming to the Hinku at all?

- WCDMA receiver has to be active before RX VCO’s output frequency and output level can be measured. Procedure is explained in section “Receiver troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Check the level of the VCO frequency in T7501 outputs. The level should be about -25...-35 dBm. If the signal level is correct in the input (-20...-30 dBm) but output level is not as expected then replace T7501.

4.2.4.7.1 Replace balun T7501

4.2.4.8 Is RX VCO frequency as expected?

- WCDMA receiver has to be active before RX VCO’s output frequency and output level can be measured. Procedure is explained in section “Receiver troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Connect the RF probe to the T7501 input.
- Check if the frequency of the RX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -20...-30 dBm.

4.2.4.8.1 RX VCO control voltage VC ok?

- WCDMA receiver has to be active before RX VCO control voltage VC can be measured. Procedure is explained in section “Receiver troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7501.
- RX VCO control voltage VC should be constant DC-voltage between 0.7 - 3.8 V. Voltage level should

change if RX channel is changed. VC is lower on lower channels and higher if higher channel numbers are used.

4.2.4.8.1.1 VCP1-voltage ok?

- WCDMA receiver has to be active before VCP1 voltage can be measured. Procedure is explained in section "Receiver troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7507.
- VCP1 voltage should be about 4.75 V.

4.2.4.8.1.1.1 C7507 and C2222 working properly?

- Check that the components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that C507 and C2222 are not short-circuited.

4.2.4.8.1.1.2 Retu ok?

4.2.4.8.1.1.3 Hinku (N7500) ok?

4.2.4.8.1.2 Balun T7501 ok?

- WCDMA receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section "Receiver troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Check the level of the VCO frequency in T7501 outputs. The level should be about -25...-35 dBm. If the signal level is correct in the input (about -20...-30 dBm) but output level is not as expected then replace T7501.

4.2.4.8.1.3 Are components near the RX VCO ok?

R7501, C7516, R7505, C7524 and C7522 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter.
- Use an ohmmeter to check also that capacitors are not short-circuited

4.2.4.8.1.4 Replace Hinku (N7500) or RX VCO (G7500) or both

4.2.4.8.2 Replace RX VCO G7500

4.2.4.9 Is RX VCO signal level in the T7501 output high enough?

- WCDMA receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section "Receiver troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Check the level of the VCO frequency in T7501 outputs. The level should be about -25...-35 dBm. If the signal level is correct in the input (about -20...-30 dBm) but output level is not as expected then replace T7501.

4.2.4.9.1 RX VCO G7500 output level high enough?

- WCDMA receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section "Receiver troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Connect the RF probe to the T7501 input.
- Check if the frequency of the RX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -20...-30 dBm.

4.2.4.9.1.1 Replace RX VCO G7500

4.2.4.9.2 Replace balun T7501

4.2.4.10 Are capacitors C7530, C7532, C7534 and C7536 in place?

- Check that components are in place and solder joints are ok

4.2.4.11 VCTCXO frequency and output level correct?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCXO should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCXO output signal is presented in figure 6.5.1 "VCTCXO Output (DC Offset 1.24V)".

4.2.4.11.1 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513)
- VXO-voltage should be about 2.5 V

4.2.4.11.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

4.2.4.11.1.2 Replace Retu

4.2.4.11.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCXO (G7501) or all three components

4.2.4.11.2 BB AFC-voltage ok?

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to R7509 (or C7533)
- AFC-voltage may vary between 0.1 - 2.3 V. Typical value is 1.2 V. Phoenix “RF Controls” tool can be used to change the AFC value. Voltage level should be about 0.1 V with AFC value -1024 and about 2.3 V with AFC value 1023.

4.2.4.11.2.1 Low pass filter components R7509 and C7533 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7509 resistance value with an ohmmeter.
- Use an ohmmeter to find out also if the AFC-line is short-circuited to the ground. If short-circuit is found replace C7533. If this does not help then go to the next steps.

4.2.4.11.2.2 VCTCXO ok?

- Remove R7509. If AFC-voltage is correct after removing then replace faulty VCTCXO G7501 and solder R7509 (new component) back to the PWB

4.2.4.11.2.3 Replace Retu

4.2.4.11.3 Replace VCTCXO G7501

4.2.5 Does RAP3G ASIC get ok VREFCM-signal from Hinku (N7500)? Signal level ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to J7516.
- VREFCM voltage should be about 780 mV (continuous voltage).

4.2.5.1 Hinku (N7500) RB_EXT voltage ok?

- See section "Hinku (N7501) RB_EXT voltage ok?"

4.2.5.2 Replace Hinku (N7500)

- Also RAP3G can be faulty but it's not possible to replace this component

4.2.6 RAP3G faulty?

- Not possible to replace!

4.3 WCDMA modulation spectrum and ACLR ok?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with a WCDMA transmitter tester or other WCDMA communication tester. Settings have to be done according to the 3GPP specifications. Modulation spectrum and ACLR measurements are possible to perform also with a spectrum analyser, but in this case measurement settings have to be done manually according to the 3GPP specifications.
- Attach the phone to the product specific test jig and a spectrum analyser or other RF-measurement device to the RF-coupler. Coupler attenuation should be also taken into account during measurements.
- If modulation spectrum is not as expected separate the phone into parts and place to the module jig (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).

4.3.1 Does N7504 give correct voltage level (Vcc11) to the WCDMA PA (N7503)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to -40 dBm (Set start level to "-40.0" in Phoenix)
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7580.
- Vcc11 voltage level should be about 1.5 V. The same voltage level should be measured also with all power levels smaller than about 10 dBm. Vcc11 is about 3.3 V with the highest power (21 dBm). NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.3.1.1 L7515, C7589 and C7580 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that L7515 is conducting DC.
- Use an ohmmeter also to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above.

4.3.1.2 Does SMPS N7504 get operating voltage Vdd (=VBAT_PA)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section

"Transmitter troubleshooting".

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- VBAT_PA voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.3.1.3 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.
- Voltage level should be about 2.78 V.

4.3.1.3.1 Replace Vinku (N7501)

4.3.1.4 Does SMPS get correct control voltage from the WCDMA power detector (signal Vcontrol)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7591.
- Vcontrol signal should be constant DC-voltage. Voltage level should change if TX power is changed. Vcontrol is lower on lower power levels and higher if higher power levels are used.
- Vcontrol should be about 570 mV with power level +10 dBm, about 2.0 V with power level +21 dBm and about 200 mV when power levels below 0 dBm are used. NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.3.1.4.1 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.
- Voltage level should be about 2.78 V.

4.3.1.4.1.1 Replace Vinku (N7501)

4.3.1.4.2 Check WCDMA power detector components – In place and value correct?

Components L7514, C7585, V7500, R7526, C7586, R7527, C7587, C7590, R7529, R7530, C7591, R7531 and C7592.

- Check that components are in place and solder joints are ok

- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter
- Use an ohmmeter also to check that L7514 is conducting DC.

4.3.1.5 Replace SMPS N7504

4.3.2 Does WCDMA PA (N7503) get correct bias currents Icont11 and Icont12?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to -40 dBm (Set start level to "-40.0" in phoenix)
- Measurements can be done with an oscilloscope and a probe.

- Connect the probe to C7579
- WCDMA PA bias current Icont_12 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.
- Connect the probe to C7576 pad. Notice: C7576 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.

- WCDMA PA bias current Icont_11 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.

4.3.2.1 Vinku (N7501) RB_EXT voltage ok?

- WCDMA transmitter has to be active before Vinku's RB_EXT voltage can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7521.
- RB_EXT voltage should be 1.325 – 1.375 V.

4.3.2.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.3.2.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

- Remember to solder a new component to R7503 pads after measurement.

4.3.2.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok

- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.3.2.1.1.1.1.1 Replace Vinku (N7501) or Hinku (N7500) or both

4.3.2.1.1.1.2 Retu ok?

4.3.2.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

4.3.2.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.3.2.1.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

4.3.2.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.3.2.1.3.3 Replace Vinku (N7501) or Hinku (N7500) or both

4.3.2.1.4 Replace Vinku (N7501)

4.3.2.2 Is capacitor C7579 in WCDMA PA (N7503) bias line working correctly?

Icont_12 missing – C7579 short-circuited?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that the capacitor is not short-circuited. If short-circuit is found replace the capacitor. If this does not help go to the next step.

4.3.2.3 Replace Vinku (N7501) or WCDMA PA (N7503)

4.3.3 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3 “ST_CDSP_TX_IQ_TEST ” these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

4.3.4 Is TX VCO signal level in the T7503 output high enough?

- WCDMA transmitter has to be active before TX VCO’s output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30…-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

4.3.4.1 TX VCO G7502 output level high enough?

- WCDMA transmitter has to be active before TX VCO’s output frequency and output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm.

4.3.4.1.1 Replace TX VCO G7502

4.3.4.2 Replace balun T7503

4.3.5 Replace Vinku (N7501) or WCDMA PA (N7503) or both

5. DOES THE PHONE HAVE A RELIABLE CONNECTION TO THE NETWORK (GSM)?

This section refers to a situation when the phone registers to the GSM-network and is capable to make a call, but the call is not reliable even if the GSM-network field strength is strong. The phone call is maybe disconnected or interrupted.

5.1 GSM receiver Bit Error Rate (BER) ok?

- This test needs a GSM communication tester and if there is no that kind of tester available continue troubleshooting in section 3.2 "Does the phone give realistic RSSI-values?".
- Attach the phone to the product specific test jig and a GSM communication tester to the RF-coupler. Coupler attenuation should be also taken into account during measurements. This measurement should be done in an RF shielded box.
- Close the shield box hatch.
- Make a GSM call against the tester
- Settings to the tester have to be done according to the 3GPP specifications:
- Set base station downlink power to -102 dBm
- Bit Error Rate should be less than 2 %

5.1.1 Does the phone give realistic RSSI-values?

- See section 3.2. "Does the phone give realistic RSSI-values?"

5.1.2 Hinku (N7500) or RAP3G (D2800) faulty?

- RAP3G is not possible to replace

5.2 GSM transmitter power levels and transmit frequency ok?

- See section 3.1. "GSM transmitter power levels and transmit frequency ok?"

5.3 GSM Transmitter phase error ok?

- See section 3.3. "GSM Transmitter phase error ok?"

5.4 GSM (GMSK) modulation spectrum ok?

- See section 3.4. "GSM (GMSK) modulation spectrum ok?"

5.5 TX power vs. time ok?

- See section 3.5. "TX power vs. time ok?"

6. DOES THE PHONE HAVE A RELIABLE CONNECTION TO THE NETWORK (WCDMA)?

This section means situation when the phone registers to the WCDMA-network and is capable to make a call, but the call is not reliable even if WCDMA-network field strength is strong. The phone call is maybe disconnected or interrupted.

6.1 WCDMA receiver Bit Error Rate (BER) ok?

- This test needs a WCDMA communication tester and if there is no that kind of tester available continue troubleshooting in section 4.2 “Does the phone give realistic RSSI-values?”.
- Attach the phone to the product specific test jig and a WCDMA communication tester to the RF-coupler. Coupler attenuation should be also taken into account during measurements. This measurement should be done in an RF shielded box.
- Close the shield box hatch.
- Make a WCDMA call against the tester
- Settings to the tester have to be done according to the 3GPP specifications:

- Set base station output level (Îor) to -106.7 dBm / 3.84 MHz

- Set DPCH_Ec level to -117 dBm / 3.84 MHz

- Bit Error Rate should be less than 0.1 %

6.1.1 Does the phone give realistic RSSI-values?

- See section 4.2 “Does the phone give realistic RSSI-values?”

6.1.2 Hinku (N7500) or RAP3G (D2800) faulty?

- RAP3G is not possible to replace

6.2 WCDMA TX power and transmit frequency ok?

- See section 4.1. “WCDMA TX power and transmit frequency ok?”

6.3 WCDMA Transmitter error vector magnitude ok?

- This test needs a WCDMA communication tester and if there is no that kind of tester available continue troubleshooting in section 4.3 “WCDMA modulation spectrum and ACLR ok?”
- Attach the phone to the product specific test jig and the WCDMA communication tester to the RF-coupler. Coupler attenuation should be also taken into account during measurements. This measurement should be done in an RF shielded box.
- Close the shield box hatch.
- Make a WCDMA call against the tester
- The Error Vector Magnitude shall not exceed 17.5 % with power levels ≥ –20 dBm.
- If Error Vector Magnitude is not as expected separate the phone into parts and place to the module jig (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).

6.3.1 Is capacitor C7579 in WCDMA PA (N7503) bias line in place?

- Check that the component is in place and solder joints are ok

6.3.2 Are capacitors in Vinku REG1 and REG2 lines in place?

C7554, C7555 and C7547

- Check that components are in place and solder joints are ok

6.3.3 Are capacitors in WCDMA PA power supply lines in place?

C7569 and C7583

- Check that components are in place and solder joints are ok

6.3.4 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in section 2.3. "ST_CDSP_TX_IQ_TEST " these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

6.3.5 Is TX VCO signal level in the T7503 output high enough?

- WCDMA transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

6.3.5.1 TX VCO G7502 output level high enough?

- WCDMA transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm.

6.3.5.1.1 Replace TX VCO G7502

6.3.5.2 Replace balun T7503

6.3.6 VCTCXO frequency and output level correct?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCXO should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCXO output signal is presented in figure 6.5.1 "VCTCXO Output (DC Offset 1.24 V)".

6.3.6.1 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513)
- VXO-voltage should be about 2.5 V

6.3.6.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

6.3.6.1.2 Replace Retu

6.3.6.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCXO (G7501) or all three components

6.3.6.2 BB AFC-voltage ok?

- See section "BB AFC-voltage ok?"

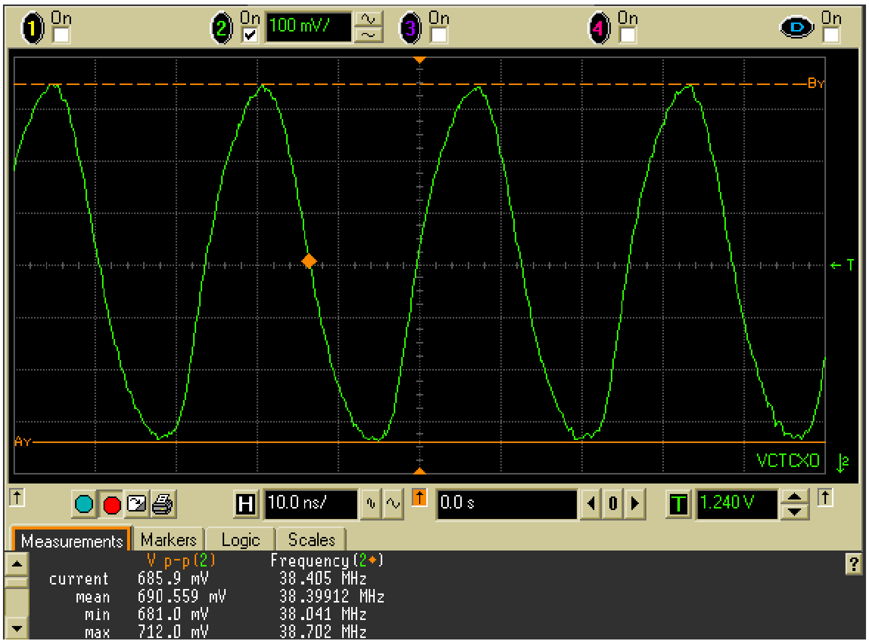
6.3.6.3 Replace VCTCXO G7501

6.4 WCDMA modulation spectrum and ACLR ok?

- See section 4.3 “WCDMA modulation spectrum and ACLR ok?”

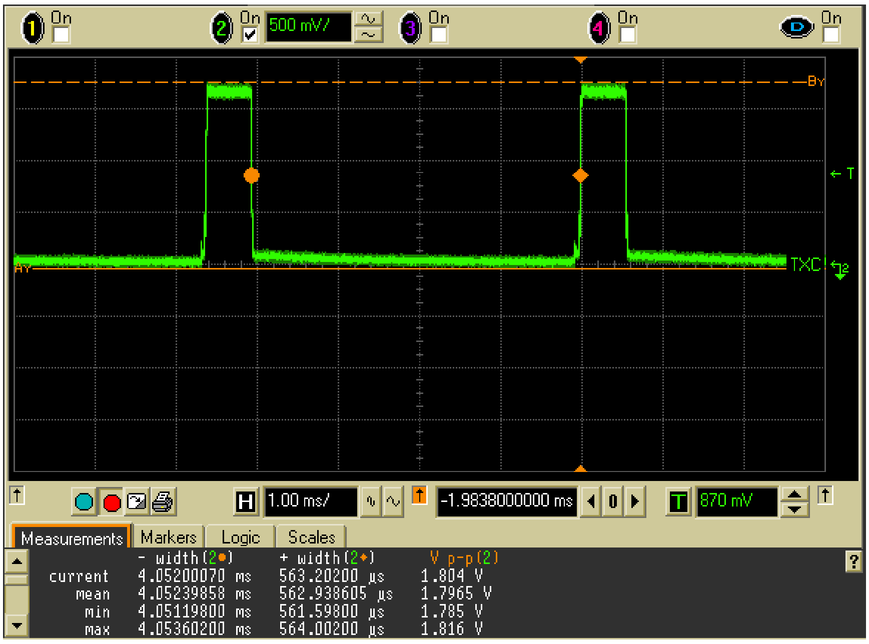
6.5 Troubleshooting pictures

6.5.1 VCTCXO Output (DC Offset 1.24 V)


1 On
2 On
100 mV/
3 On
4 On
On
BY
T
AY
VCTCXO
H
10.0 ns/
0.0 s
0
T
1.240 V
Measurements
Markers
Logic
Scales
?

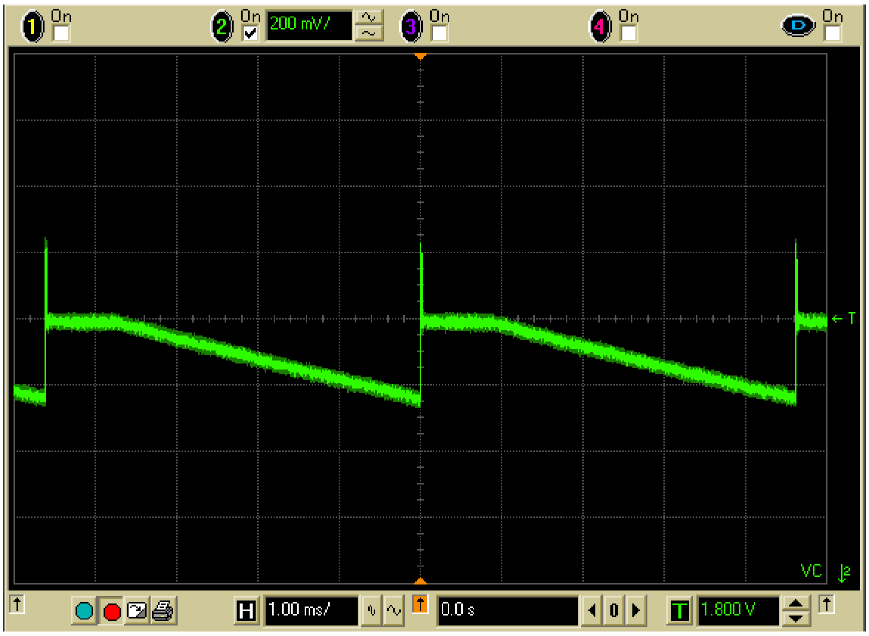
```
              V p-p(2)      Frequency(2•)
   current   685.9 mV        38.405 MHz
      mean   690.559 mV      38.39912 MHz
       min   681.0 mV        38.041 MHz
       max   712.0 mV        38.702 MHz
```

6.5.2 TXC in GSM mode (DC Offset 0 V)


1 On
2 On
500 mV/
3 On
4 On
On
BY
T
AY
TXC
H
1.00 ms/
-1.9838000000 ms
0
T
870 mV
Measurements
Markers
Logic
Scales
?

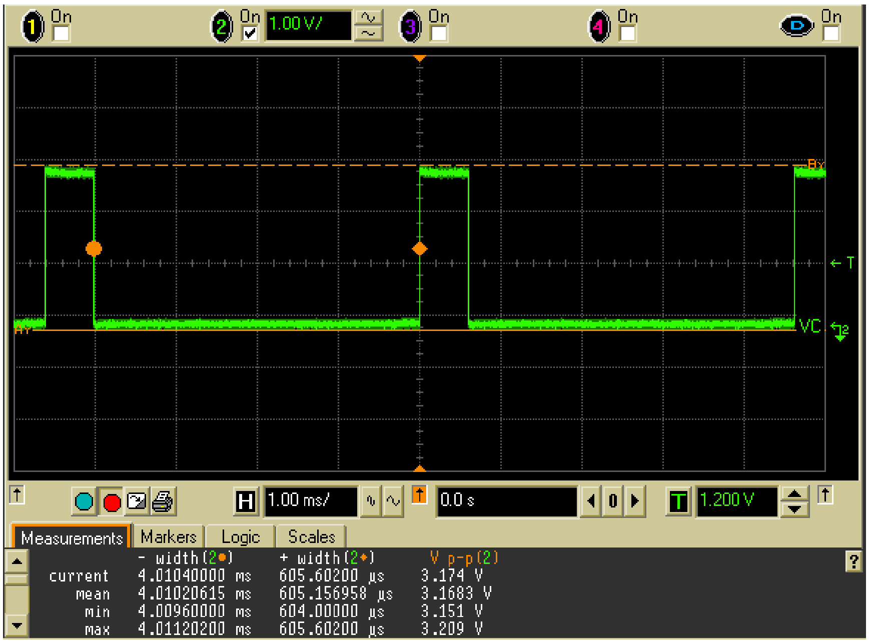
```
             - width(2•)       + width(2•)       V p-p(2)
   current   4.05200070 ms    563.20200 µs     1.804 V
      mean   4.05239858 ms    562.938605 µs    1.7965 V
       min   4.05119800 ms    561.59800 µs     1.785 V
       max   4.05360200 ms    564.00200 µs     1.816 V
```

6.5.3 TX VC in GSM mode (DC Offset 1.8 V)


1 On
2 On
200 mV/
3 On
4 On
D On
T
VC
H
1.00 ms/
0.0 s
0
T
1.800 V

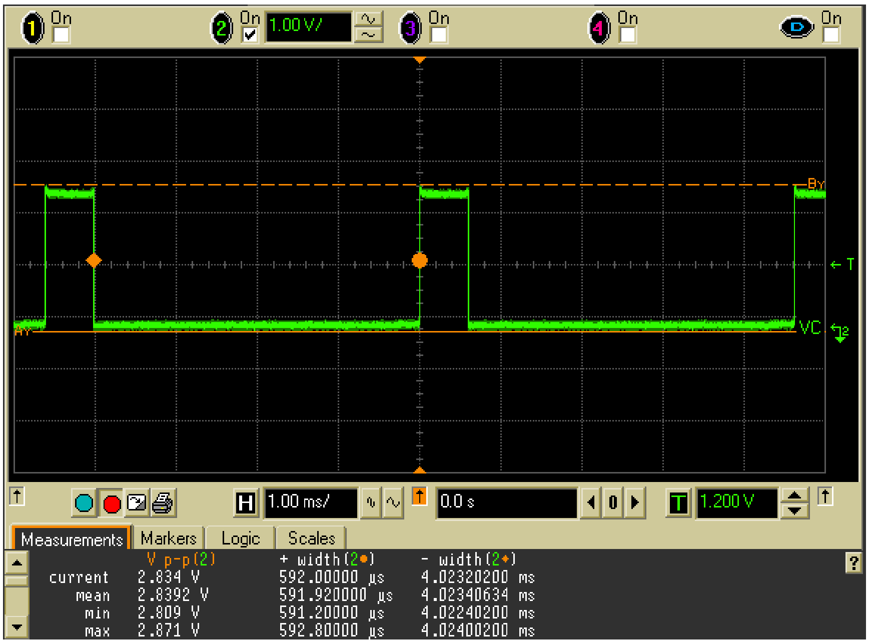
DC value changes if channel or band is changed. Upper figure has been taken in EGSM900 band and on channel 37.

6.5.4 Icont_21/Icont_22 (DC Offset 1.2 V)


1 On
2 On
1.00 V/
3 On
4 On
D On
BY
AY
T
VC
H
1.00 ms/
0.0 s
0
T
1.200 V
Measurements
Markers
Logic
Scales

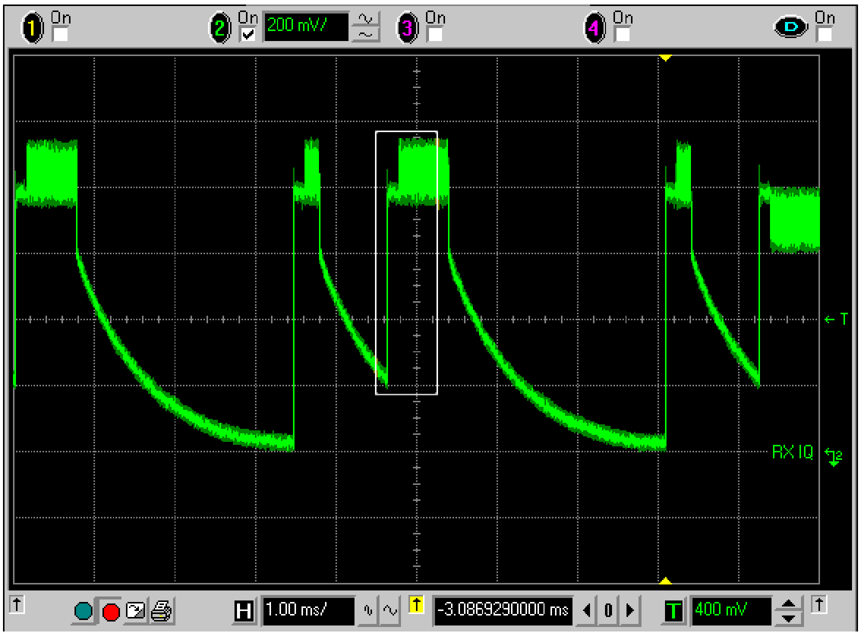
```
          - width(2●)      + width(2♦)       V p-p(2)
current   4.01040000 ms    605.60200 µs      3.174 V
   mean   4.01020615 ms    605.156958 µs     3.1683 V
    min   4.00960000 ms    604.00000 µs      3.151 V
    max   4.01120200 ms    605.60200 µs      3.209 V
```

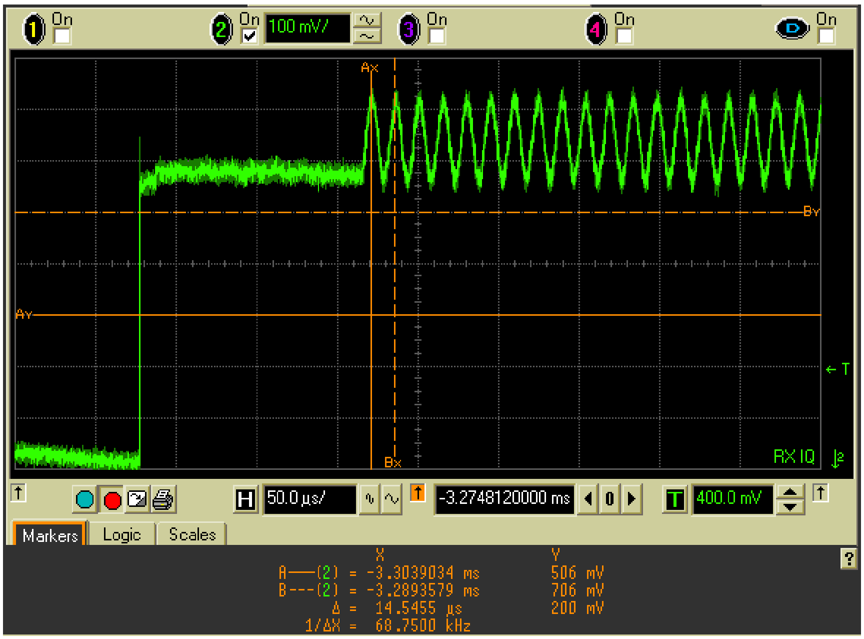
6.5.5 Icont_31/Icont_32 (DC Offset 1.2 V)


1 On
2 On 1.00 V/
3 On
4 On
On
BY
← T
AY
VC
T2
1.00 ms/
0.0 s
0
1.200 V
Measurements
Markers
Logic
Scales

```
           V p-p(2)       + width(2●)       - width(2◆)
current   2.834 V        592.00000 µs      4.02320200 ms
   mean   2.8392 V       591.920000 µs     4.02340634 ms
    min   2.809 V        591.20000 µs      4.02240200 ms
    max   2.871 V        592.80000 µs      4.02400200 ms
```

6.5.6 GSM RX IQ (DC Offset 0.4 V)

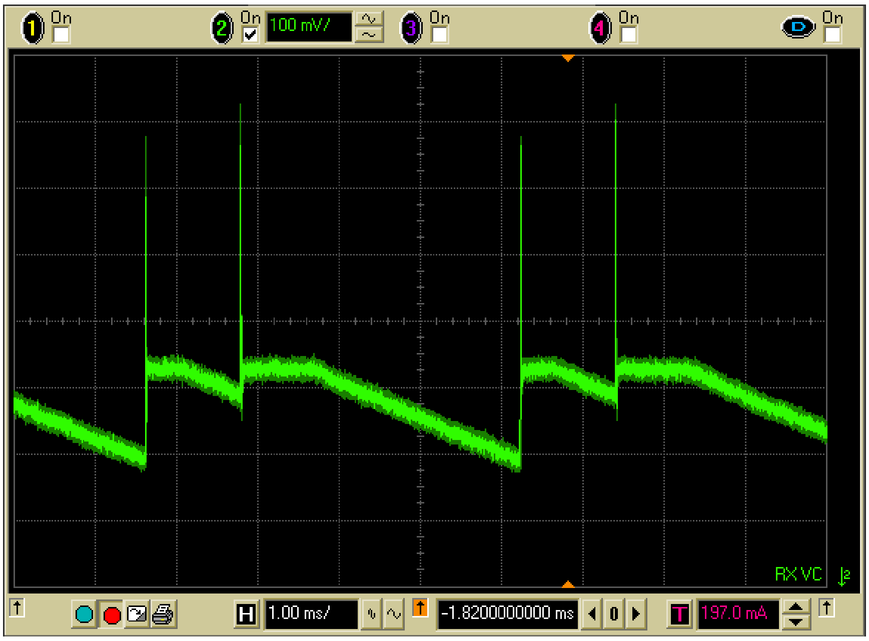

1 On
2 On 200 mV/
3 On
4 On
D On
RX IQ
T
H 1.00 ms/
-3.0869290000 ms
0
T 400 mV


1 On
2 On 100 mV/
3 On
4 On
D On
Ax
Bx
Ay
By
RX IQ
T
H 50.0 µs/
-3.2748120000 ms
0
T 400.0 mV
Markers
Logic
Scales
?

```
                 X                       Y
A——(2) = -3.3039034 ms                506 mV
B---(2) = -3.2893579 ms               706 mV
     Δ =  14.5455 µs                  200 mV
  1/ΔX =  68.7500 kHz
```

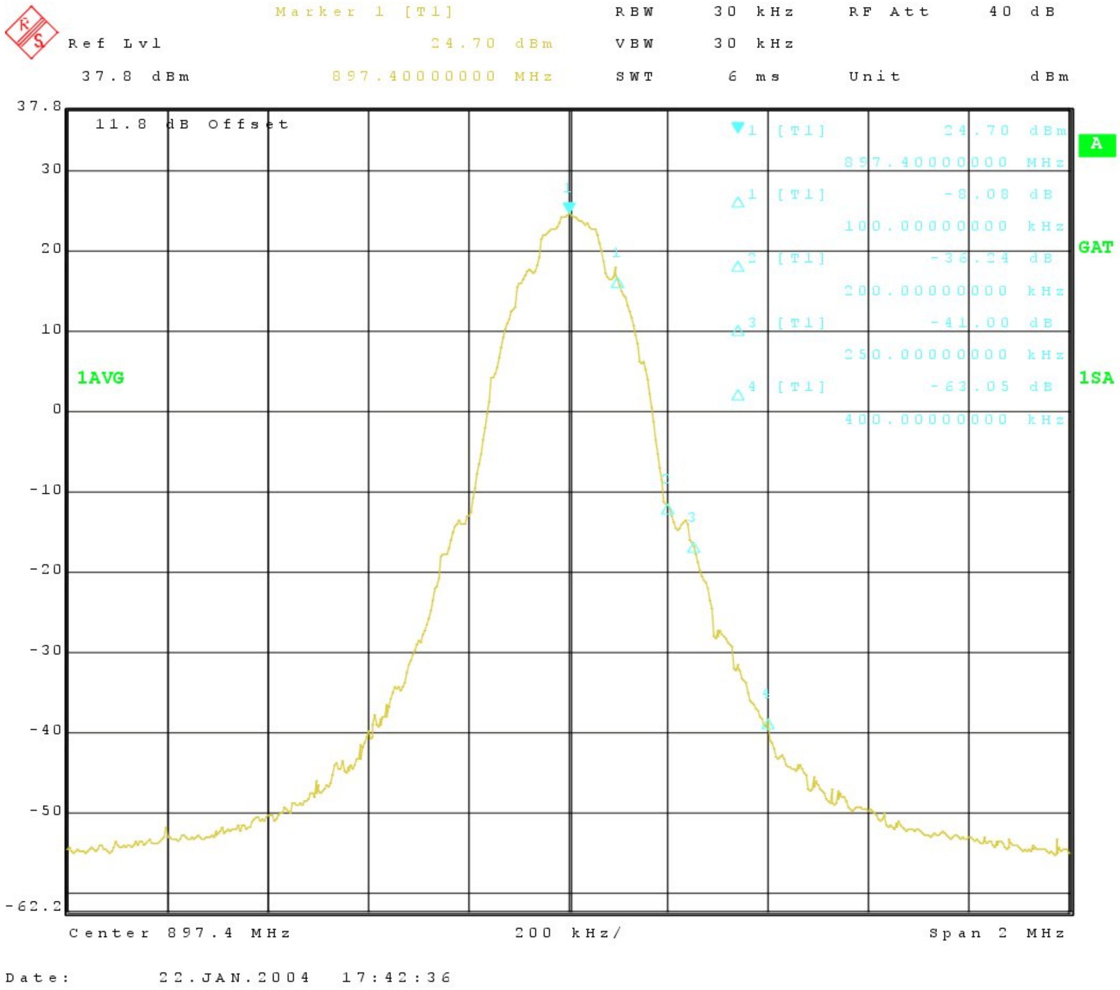
The lower figure is a detail from the upper figure (detail area marked with a white box).

6.5.7 RX VC in GSM mode (DC Offset 1.5 V)


1 On
2 On
100 mV/
3 On
4 On
D On
RX VC
H 1.00 ms/
-1.8200000000 ms
0
T 197.0 mA

DC value changes if channel or band is changed. Upper figure has been taken in EGSM900 band and on channel 37.

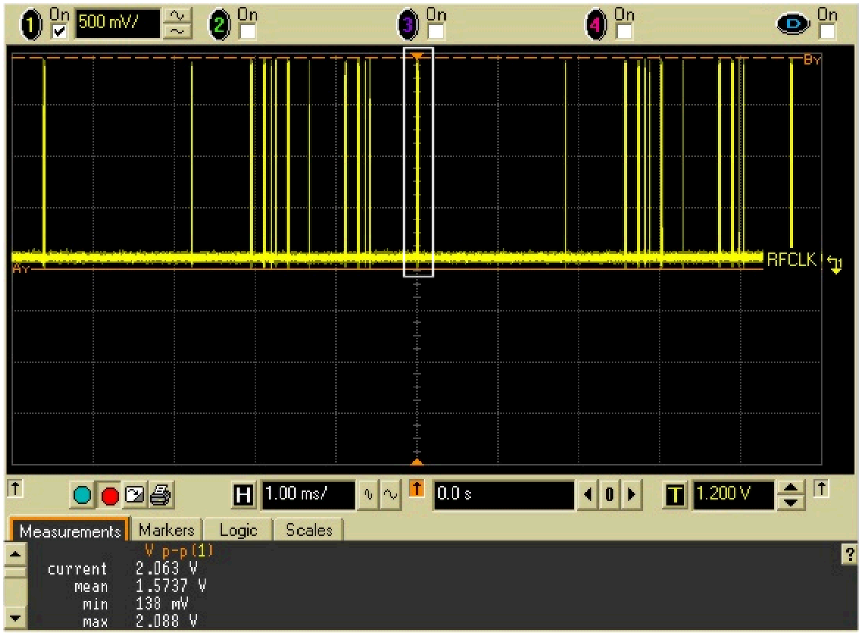
6.5.8 TX Modulation spectrum (GSM)


Marker 1 [T1]
Ref Lvl
24.70 dBm
37.8 dBm
897.40000000 MHz
RBW 30 kHz
VBW 30 kHz
SWT 6 ms
RF Att 40 dB
Unit dBm
37.8
11.8 dB Offset
▼1 [T1] 24.70 dBm
897.40000000 MHz
△1 [T1] -8.08 dB
100.00000000 kHz
△2 [T1] -36.24 dB
200.00000000 kHz
△3 [T1] -41.00 dB
250.00000000 kHz
△4 [T1] -63.05 dB
400.00000000 kHz
A
GAT
1SA
1AVG
30
20
10
0
-10
-20
-30
-40
-50
-62.2
Center 897.4 MHz
200 kHz/
Span 2 MHz
Date: 22.JAN.2004 17:42:36

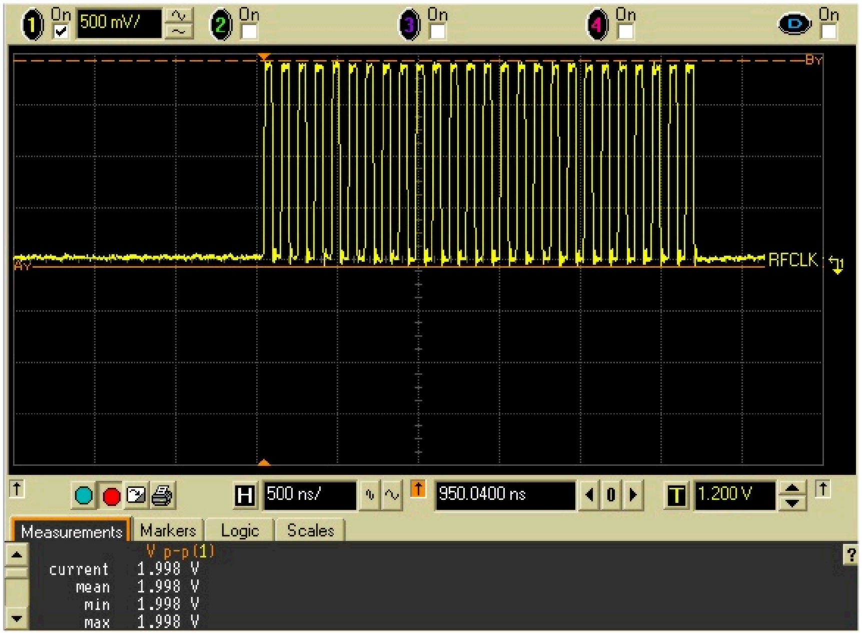
Example of the TX modulation spectrum (GMSK) in EGSM900 band.

6.5.9 RFBUS

6.5.9.1 RFBUSCLK (GSM RX)


1 On ☑ 500 mV/
2 On ☐
3 On ☐
4 On ☐
D On ☐
BY
AY
RFCLK
H 1.00 ms/
0.0 s
T 1.200 V
Measurements
Markers
Logic
Scales

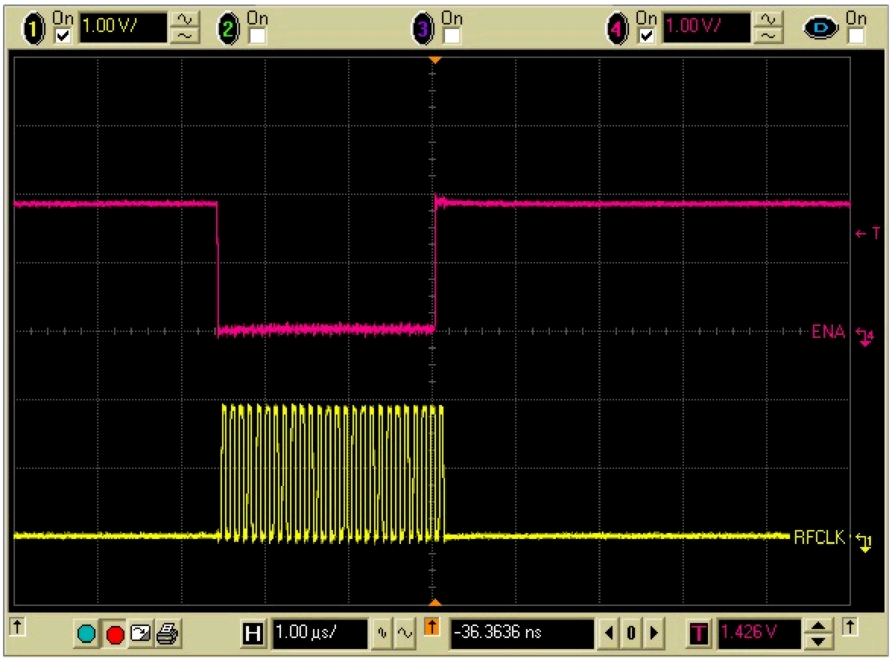
```
        V p-p(1)
current  2.063 V
   mean  1.5737 V
    min  138 mV
    max  2.088 V
```


1 On ☑ 500 mV/
2 On ☐
3 On ☐
4 On ☐
D On ☐
BY
AY
RFCLK
H 500 ns/
950.0400 ns
T 1.200 V
Measurements
Markers
Logic
Scales

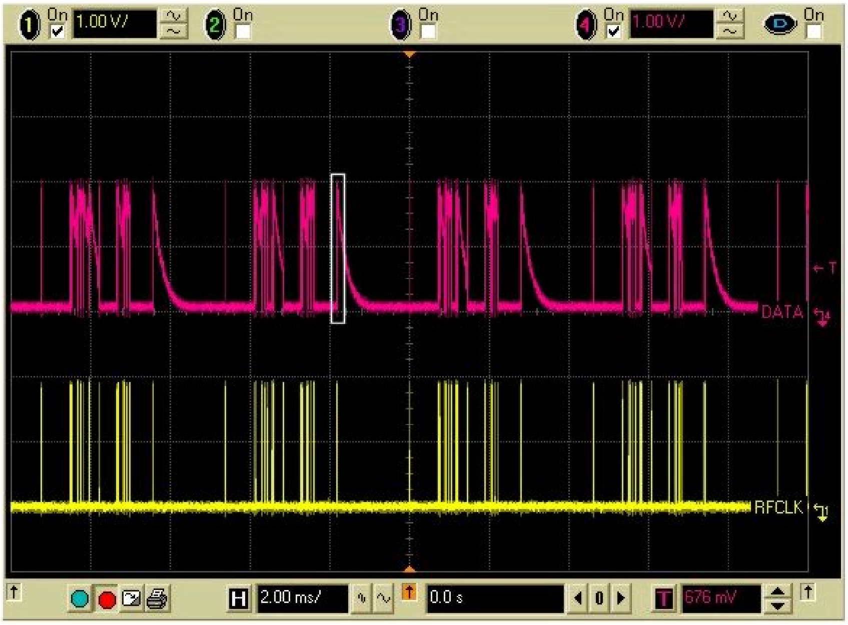
```
        V p-p(1)
current  1.998 V
   mean  1.998 V
    min  1.998 V
    max  1.998 V
```

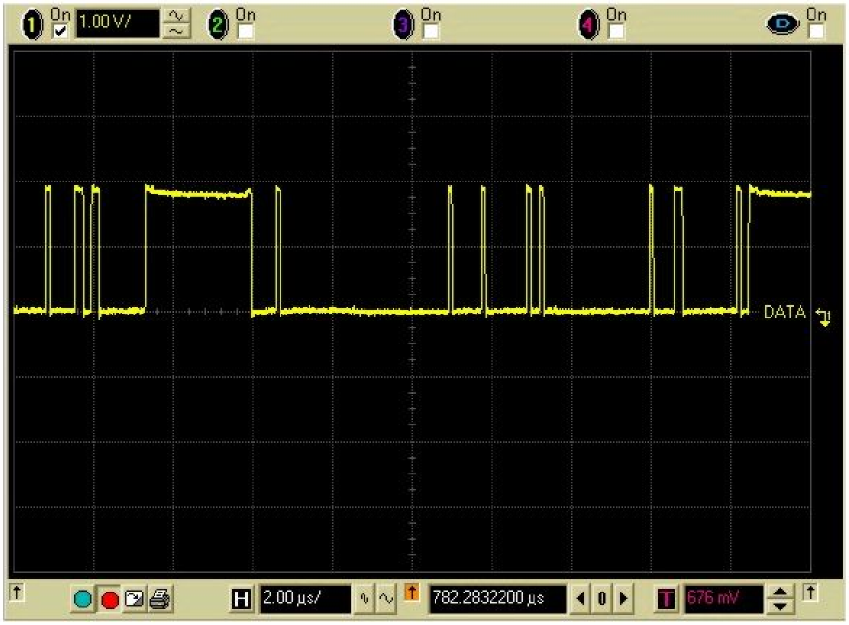
The lower figure is a detail from the upper figure (detail area marked with a white box).

6.5.9.2 RFBUSCLK and RFBUSENA (GSM RX)


On
1.00 V/
On
On
On
1.00 V/
On
T
ENA
RFCLK
H
1.00 µs/
-36.3636 ns
0
T
1.426 V

6.5.9.3 RFBUSDAT (GSM RX)


1 On 1.00 V/
2 On
3 On
4 On 1.00 V/
On
DATA
RFCLK
H 2.00 ms/
0.0 s
T 676 mV


1 On 1.00 V/
2 On
3 On
4 On
On
DATA
H 2.00 µs/
782.2832200 µs
T 676 mV

The lower figure is a detail from the upper figure (detail area marked with a white box).

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8 — Camera Module Troubleshooting

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Introduction to camera module troubleshooting

Background, tools and terminology

Faults or complaints in camera operation can be roughly categorised into three subgroups:

1. Camera is not functional at all; no image can be taken.
2. Images can be taken but there is nothing recognizable in them.
3. Images can be taken and they are recognizable but for some reason the quality of images is seriously degraded, or customer complains about image quality..

Image quality is very hard to measure quantitatively, and even comparative measurements are difficult (comparing two images) to do, if the difference is small. Especially if the user is not satisfied with his/her device's image quality, and tells, for example, that the images are not sharp, it is fairly difficult to accurately test the device and get an exact figure which would tell whether the device is functioning properly.

Often subjective evaluation has to be used for finding out if a certain property of the camera is acceptable or not. Some training or experience of a correctly operating reference device may be needed in order to detect what actually is wrong, or is there anything wrong at all.

It is easy for the user to take bad images in bad conditions. Therefore the camera operation has to be checked always in constant conditions (lighting, temperature) or by using a second, known-to-be good device as reference. Experience helps significantly in analysing image quality.

Terms

Autofocus	Camera module contains lens movement mechanics for focus adjustment. Autofocus enables camera to take sharp images of objects positioned between 10cm to infinity. During AF the viewfinder image will be momentarily blurred as the camera searches for the right focus setting.
Dynamic range	Camera's ability to capture details in dark and bright areas of the scene simultaneously. See "Image taken against light (page)" for an example.
Exposure time	Camera modules use silicon sensor to collect light and for forming an image. The imaging process roughly corresponds to traditional film photography, in which exposure time means the time during which the film is exposed to light coming through optics. Increasing the time will allow for more light hitting the film and thus results in brighter image. The operation principle is exactly the same with silicon sensor, but the shutter functionality is handled electronically i.e. there is no mechanical moving parts like in film cameras.
Flicker	Phenomenon, which is caused by pulsating in scene lighting, typically appearing as wide horizontal stripes in an image.
Noise	Variation of response between pixels with same level of input illumination. See "Noisy image (page)" for an example.
Resolution	Usually the amount of pixels in the camera sensor; for example, RM-42 has a 1600 x 1200 pixel sensor resolution. In some occasions the term resolution is used for describing the sharpness of the images.
Sensitivity	Camera module's sensitivity to light. In equivalent illumination conditions, a less sensitive camera needs a longer exposure time to gather enough light in forming a good image. Analogous to ISO speed in photographic film.

Sharpness	Good quality images are 'sharp' or 'crisp', meaning that image details are well visible in the picture. However, certain issues, such as non-idealities in optics, cause image blurring, making objects in picture to appear 'soft'. Each camera type typically has its own level of performance.

The effect of image taking conditions on image quality

There are some factors, which may cause poor image quality, if not taken into account by the end user when shooting images, and thus may result in complaints. The items listed are normal to camera operation and are not a reason for changing the camera module.

Autofocus

When the camera is focusing a lens is moved inside the module to give the sharpest possible image. This camera module is specified to operate satisfactorily from 10 cm to infinite distance of scene objects. Trying to photograph objects closer than 10 cm is likely to result in a blurred out of focus image. The lack of sharpness is first visible in full resolution (1600 x 1200) images. Images taken very close to the subject, a limited depth of focus will be visible, that is the upper or lower parts of the image may be out of focus. This is normal; do not change the camera module.

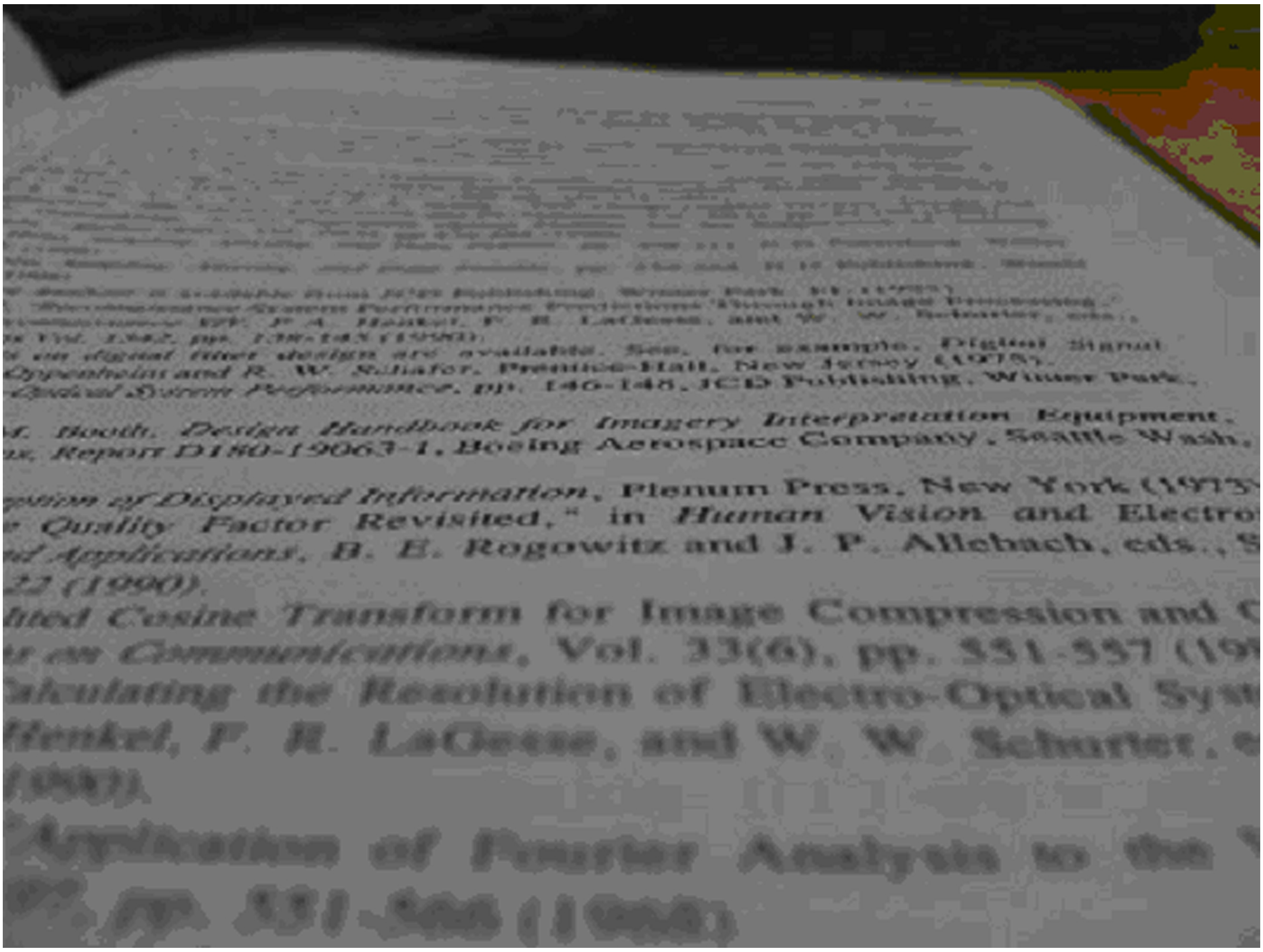


Figure 73 Only center part of image is in focus due to limited depth of focus

The amount of light available

In dim conditions camera runs out of sensitivity. The exposure time is long (especially in the night mode) and the risk of getting shaken (= blurred) images increases. In addition, image noise level grows. The maximum exposure time in the night mode is ¼ seconds. Therefore, images need to be taken with extreme care and by supporting the phone when the amount of light reflected from the target is low. Because of the longer exposure time and larger gain value, noise level increases in low light conditions. Sometimes blurring may even occur in daytime, if the image is taken very carelessly. See the figure below for an example. This is normal; do not change the camera module.

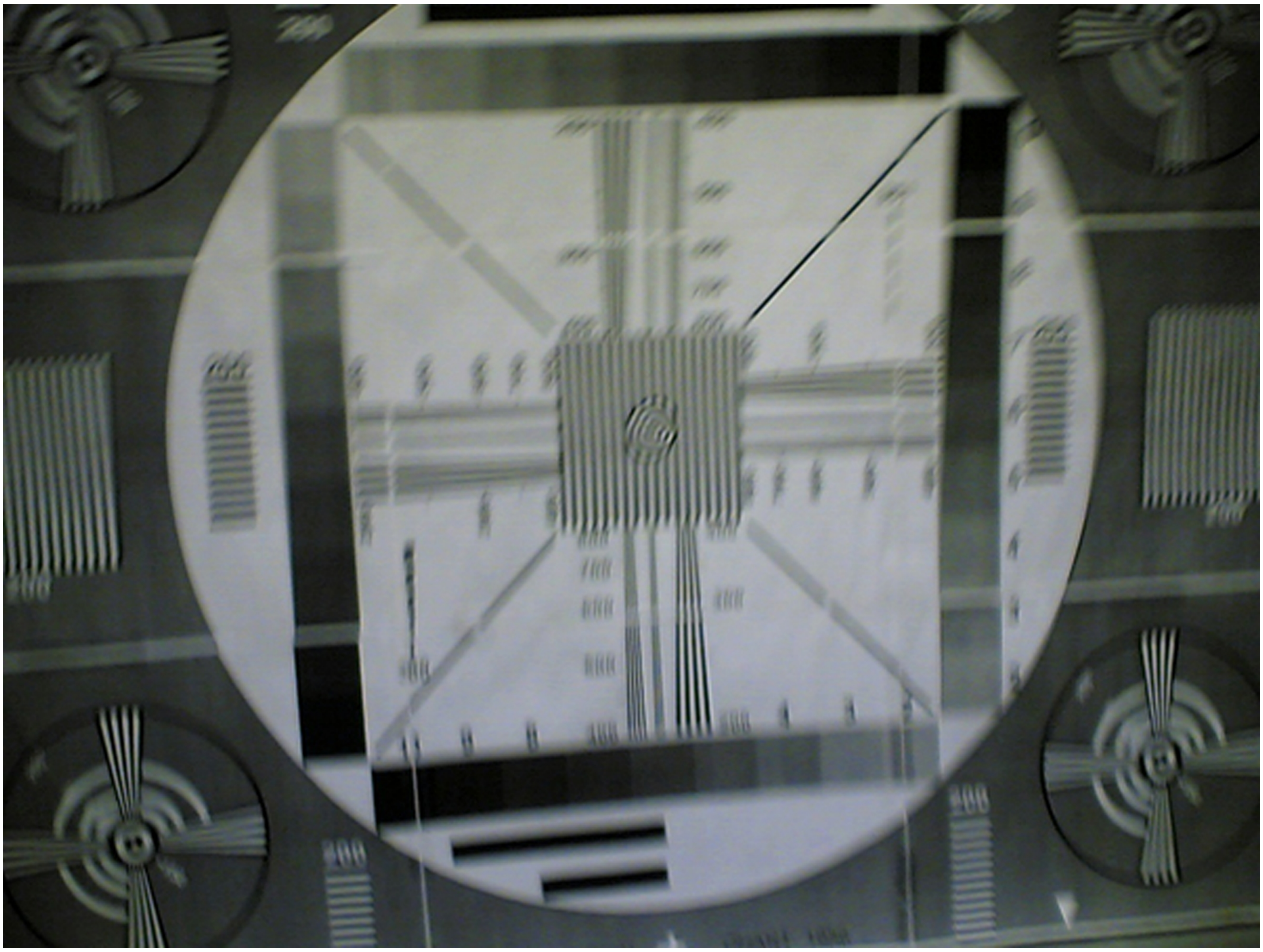


Figure 74 Blurring caused by shaking hands

Movement in bright light

If an image is taken of moving objects or if the device is used in a moving vehicle, object 'skewing' or 'tilting' may occur. This phenomenon is fundamental to most CMOS camera types, and usually cannot be avoided. The movement of camera or object sometimes cause blurring indoors or in dim lighting conditions because of long exposure time. This is normal; do not change the camera module.

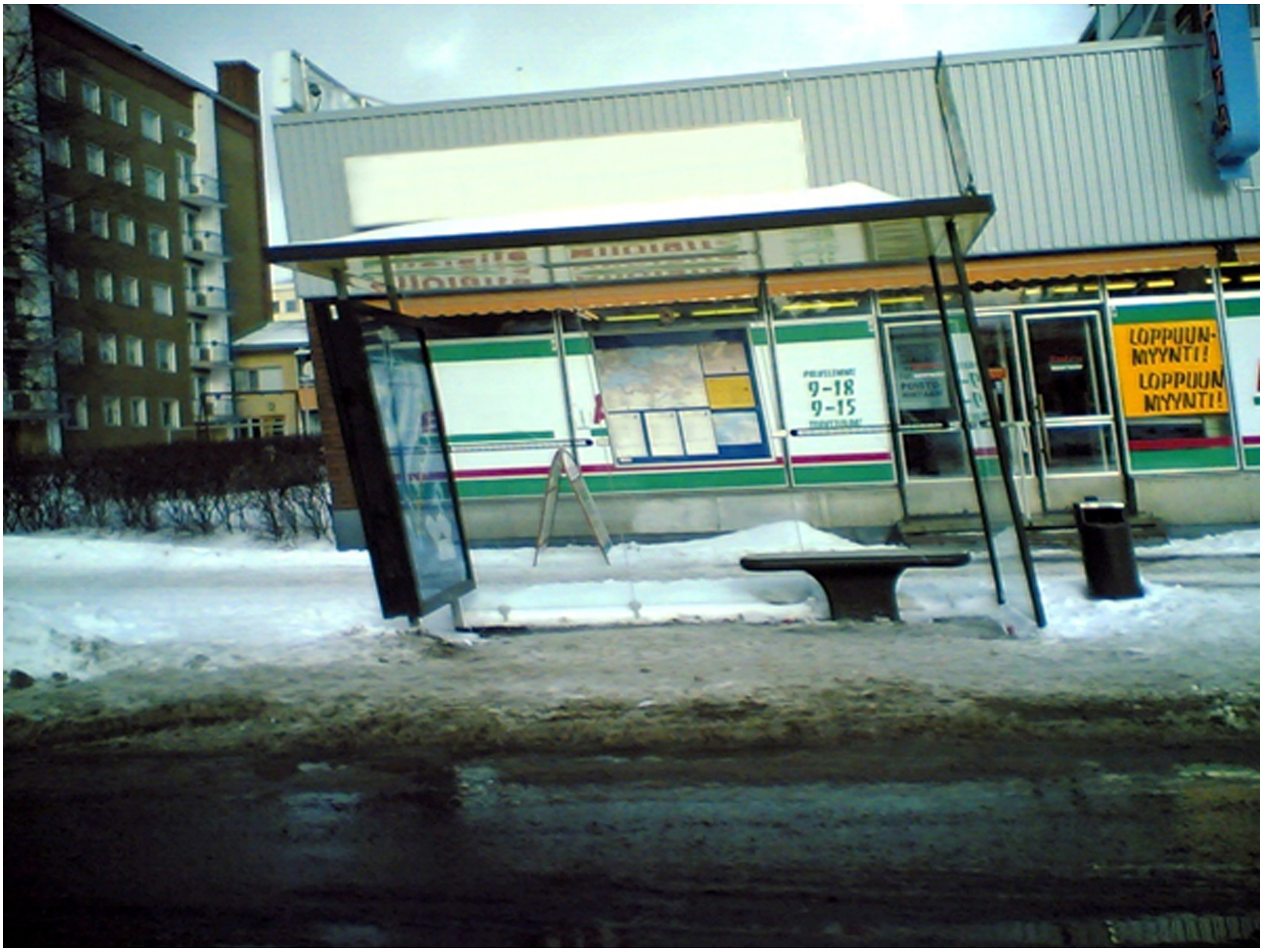


Figure 75 Near objects get skewed when taking images from a moving vehicle

Temperature

High temperatures inside the mobile phone cause more noise to appear in images. For example, in +70 degrees (Celsius), the noise level may be very high, and it further grows if the conditions are dim. If the phone processor has been heavily loaded for a long time before taking an image, the phone might have considerably higher temperature inside than in the surrounding environment. This is also normal to camera operation; do not change the camera module.

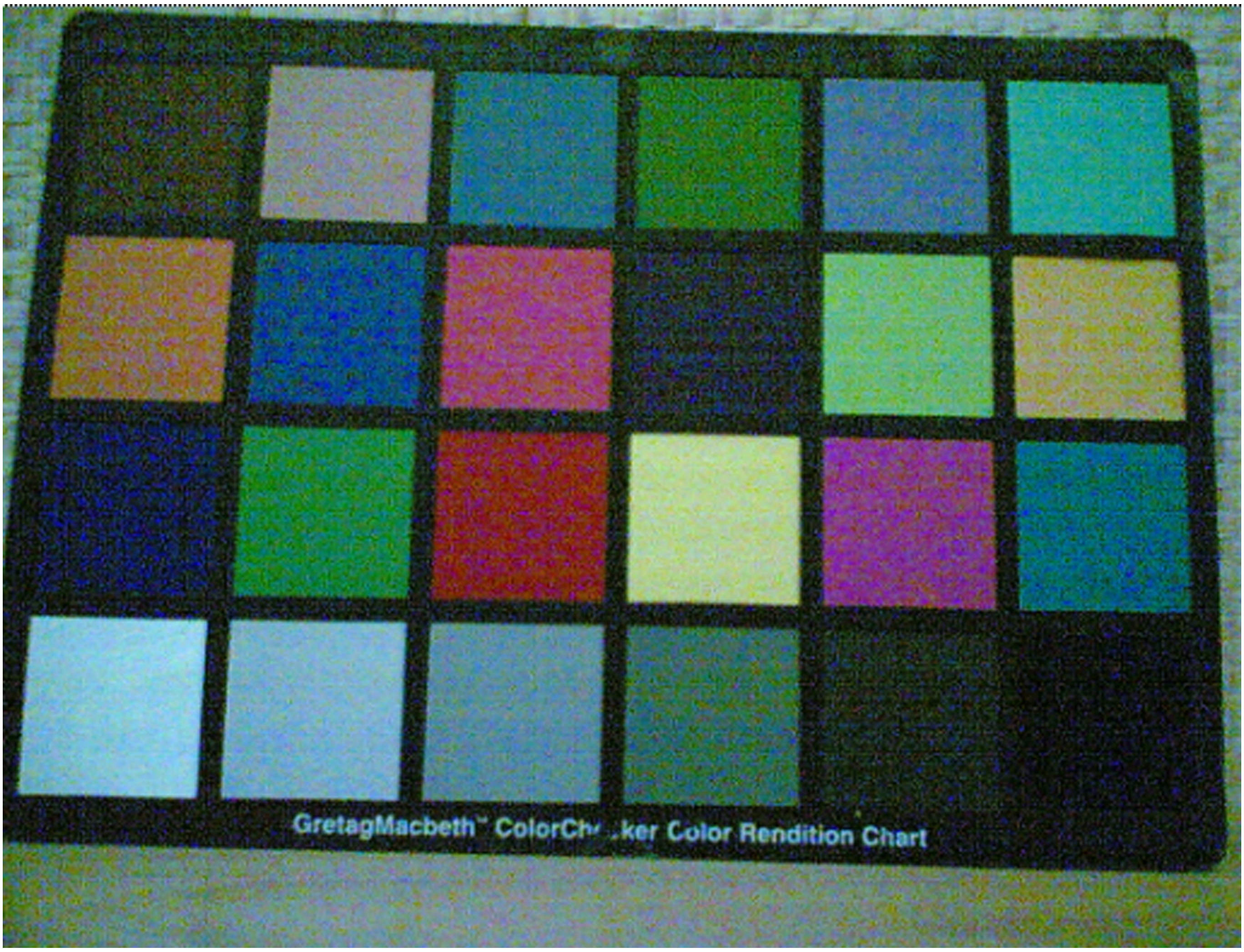


Figure 76 Noisy image taken in +70 degrees Celsius

Phone display

If the display contrast is set too dark, the image quality degrades: the images may be very dark depending on the setting. If the display contrast is set too bright, image contrast appears bad and "faint". This problem is solved by setting the display contrast correctly. This is normal behaviour; do not change the camera module.

Basic rules of photography (especially shooting against light)

Because of dynamic range limitations, taking images against bright light might cause either saturated image or the actual target appear too dark. In practice, this means that when taking an image indoors and having, for example, a window behind the object, the result is usually poor. This is normal behaviour; do not change the camera module.

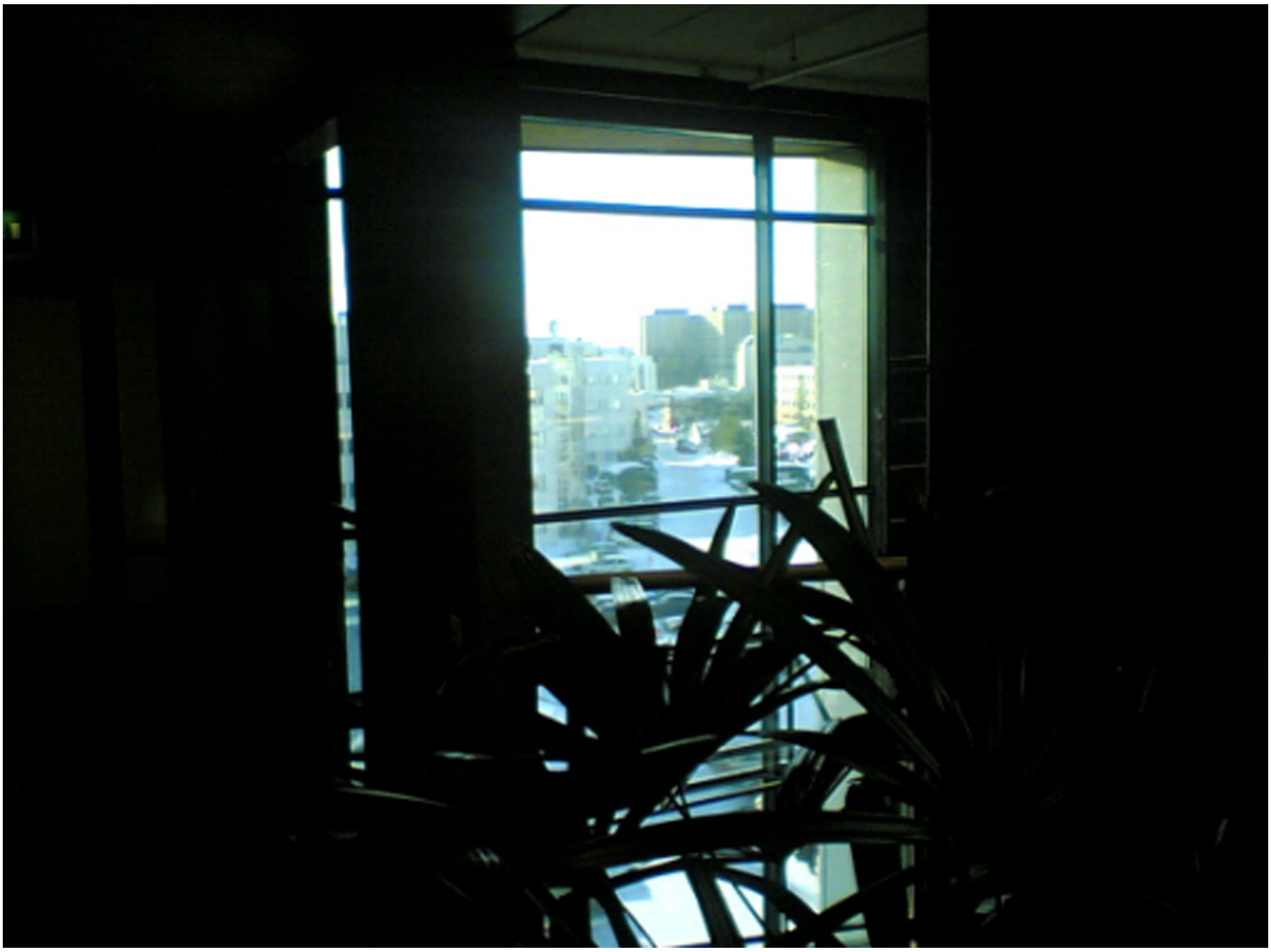


Figure 77 Image taken against light

Flicker

In some occasions a bright fluorescent light may cause flicker in the viewfinder and captured image. This phenomenon may also be a result, if images are taken indoors under the mismatch of 50/60 Hz electricity network frequency. The electricity frequency used is automatically detected by the camera module. In some very few countries, both 50 and 60 Hz networks are present and thus probability for the phenomenon increases. Flickering occurs also under high artificial illumination level. This is normal behaviour; do not change the camera module.

Figure 78 Flicker in an image; object illuminated by strong fluorescent light

Bright light outside of image view

Especially the sun can cause clearly visible lens glare phenomenon and poor contrast in images. This happens because of undesired reflections inside the camera optics. Generally this kind of reflections are common in all optical systems. This is normal behaviour; do not change the camera module.

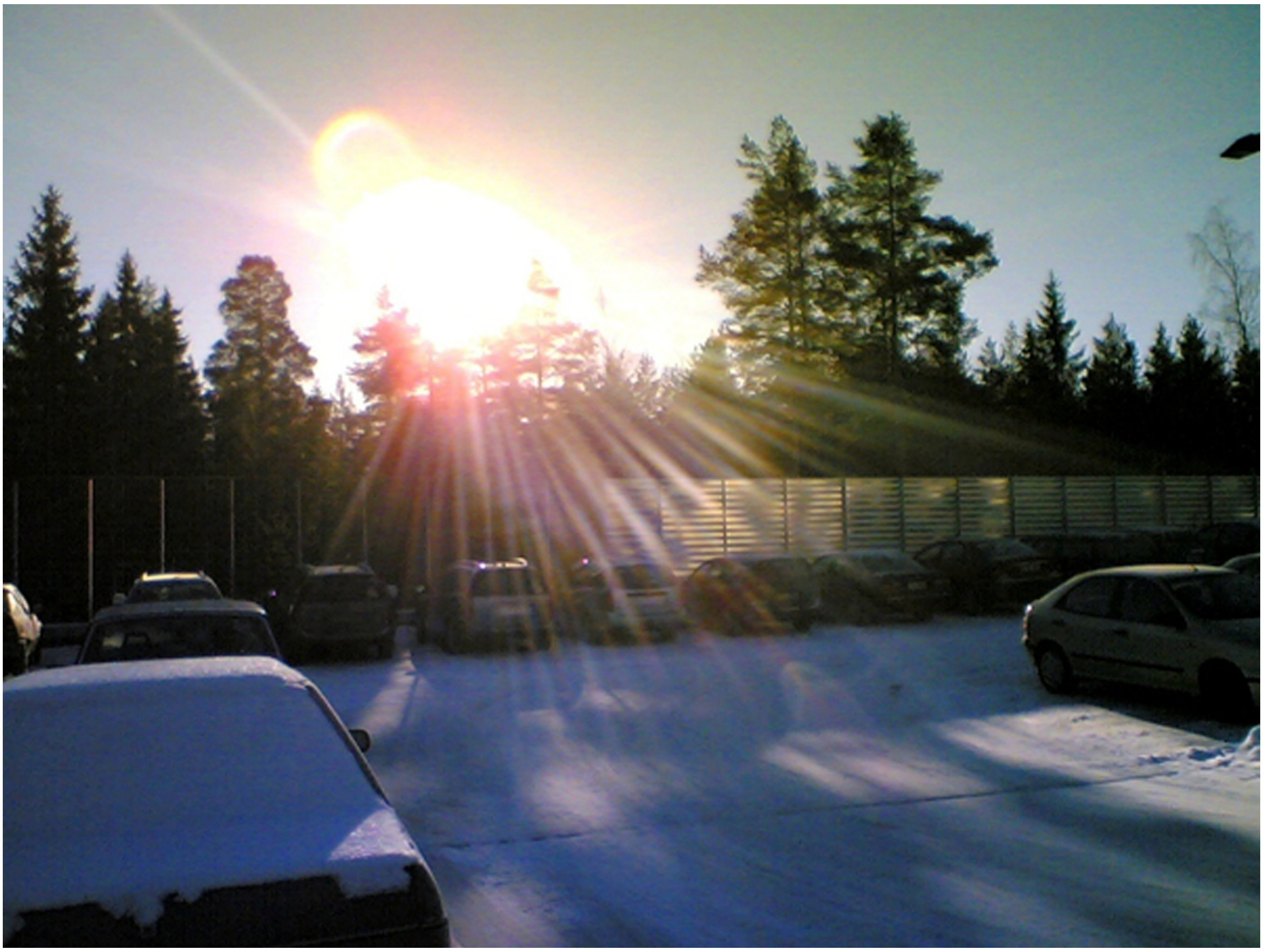


Figure 79 A lens reflection effect caused by sunshine

Examples of good quality images

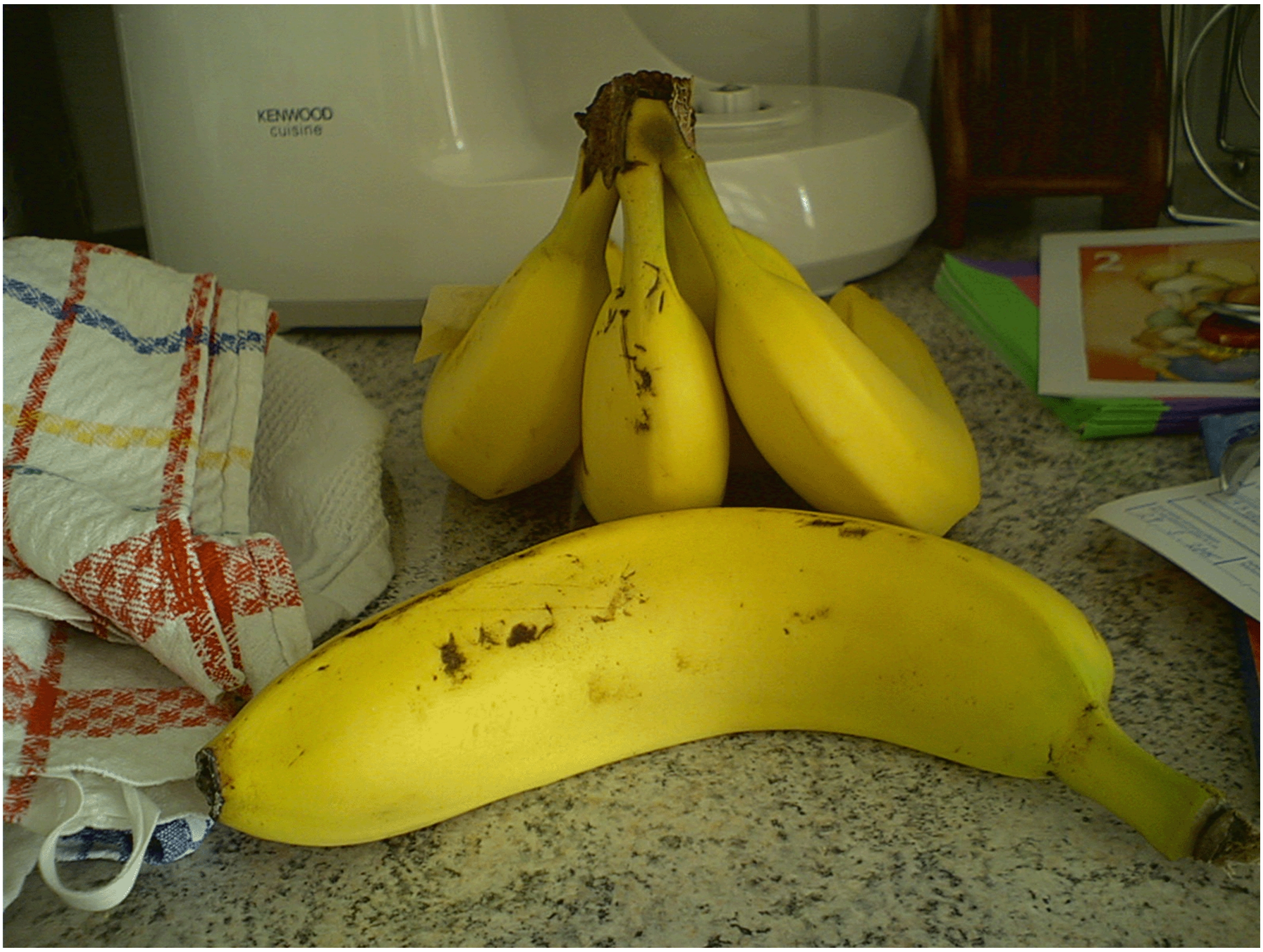


Figure 80 Good image taken indoors

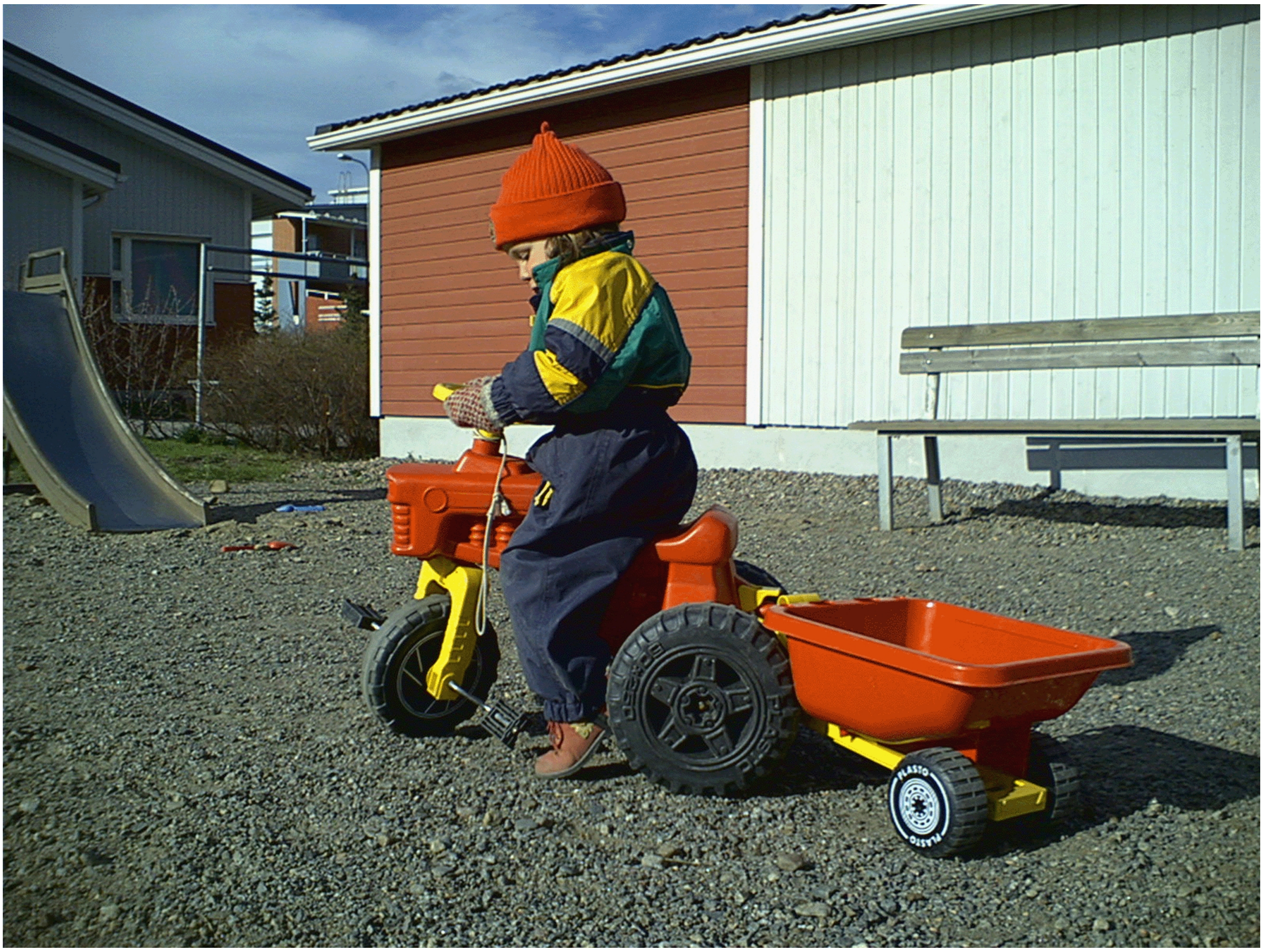


Figure 81 Good image taken outdoors

Image quality analysis

Possible faults in image quality

When checking for possible errors in camera functionality, knowing what error is suspected significantly helps the testing by narrowing down the amount of test cases. The following types of image quality problems may be expected to appear:

- Dust (black spots)
- Lack of sharpness
- Bit errors

In addition, there are many other kinds of possibilities for bad image quality, but those are ruled out from the scope of this document since the probability of their appearance is small.

Testing for dust in camera module

Symptoms and diagnosis

For detecting these kinds of problems, take an image of a uniform white surface and analyse it in full resolution. A good quality PC monitor is preferred for analysis. Search carefully, since finding these defects is not always easy. Figure "Effects of dust on optical path" is an example image containing easily detectable dust problems.

When taking a white image, use uniformly lightened white paper or white wall. One possibility is to use uniform light but in this case make sure that the camera image is not flickering when taking the test image. In case flickering happens, try to reduce illumination level. Use JPEG image format for analysing, and set the image quality parameter to ‘High Quality’.

Black spots in an image are caused by dirt particles trapped inside the optical system. Clearly visible and sharp edged black dots in an image are typically dust particles on the image sensor. These spots are searched for in the manufacturing phase, but it is possible that the camera body cavity contains a particle, which may move onto the image sensor active surface, for example, when the phone is dropped. Thus it is also possible that the problem will disappear before the phone is brought to service. The camera should be replaced if the problem is present when the service technician analyses the phone.

If a dust particle is lying on the infrared filter surface on either side, they are hard to locate because they are out of focus, and appear in the image as large, grayish and fading-edge 'blobs'. Sometimes they are invisible to the eye, and thus the user probably does not notice them at all. However, it is possible that a larger particle disturbs the user, causing need for service.

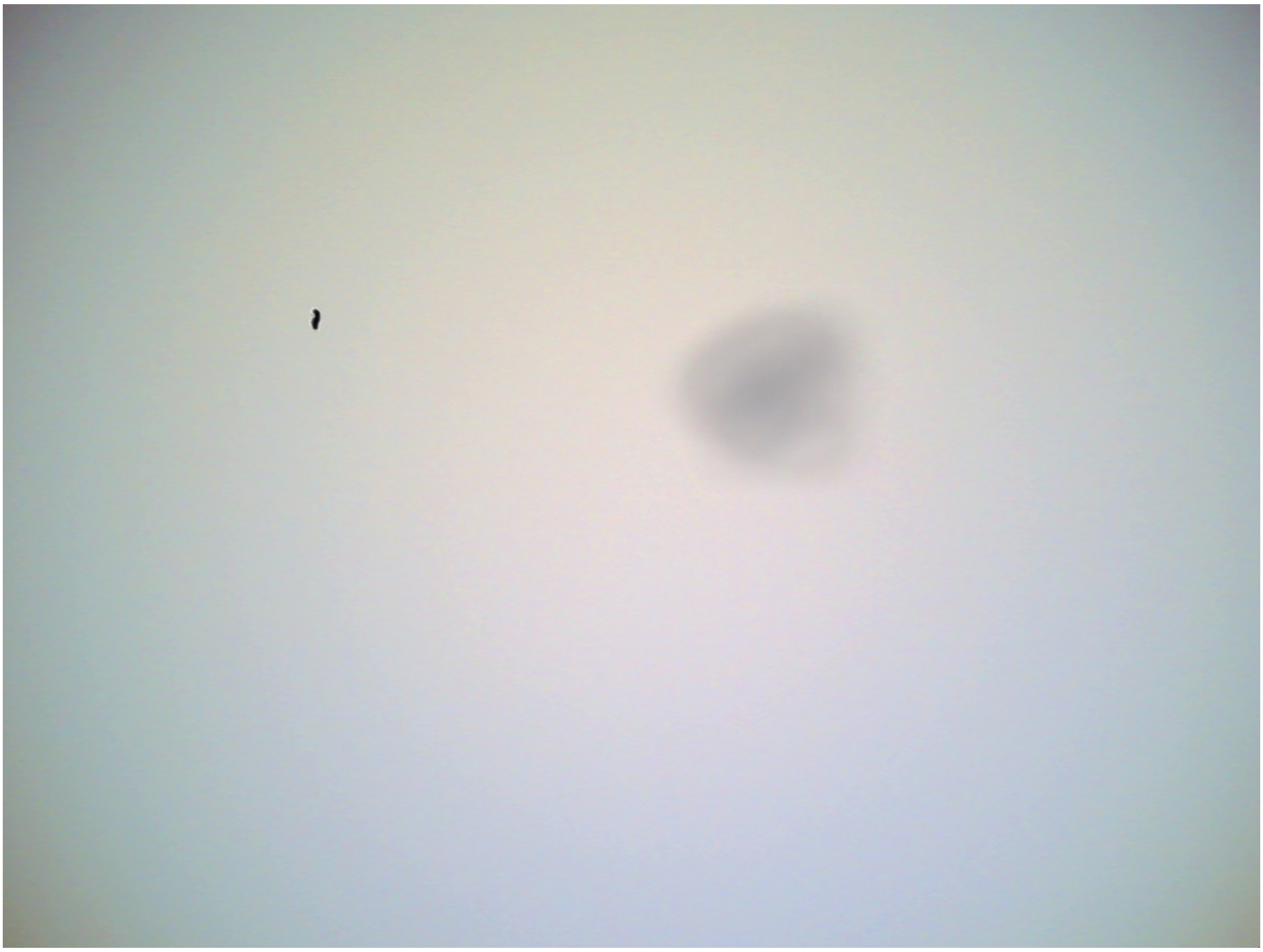


Figure 82 Effects of dust on optical path

If large dust particles get trapped on top of the lens surface in the cavity between camera window and lens, they will cause image blurring and poor contrast. The dust gasket between the window and lens should prevent any particles from getting into the cavity after the manufacturing phase.

If dust particles are found on the sensor, this is classified as a manufacturing error of the module and the camera should be replaced. Any particles inside the cavity between the protection window and lens have most probably been trapped there in the assembly phase at a Nokia factory. Unauthorized disassembling of the product can also be the root of the problem. However, in most cases it should be possible to remove the particle(s) by using clean compressed air. Never wipe the lens surface before trying compressed air; the possibility of damaging the lens is substantial. Always check the image sharpness after removing dust.

Testing camera image sharpness

Symptoms and diagnosis

If pictures taken with a device are claimed to be blurry, there are five possible sources for the problem:

1. The protection window is fingerprinted, soiled, dirty, visibly scratched or broken.
2. The camera module has failed to focus correctly, producing a blurred image.
3. User has tried to take pictures in too dark conditions, and images are blurred due to handshake or movement. This is not a cause to replace camera module.
4. There is dirt between the protection window and the camera lens.
5. The protection window is defective. This can be either a manufacturing failure or caused by the user. The window should be changed.

A quantitative analysis of sharpness is very difficult to conduct in any other environment than optics laboratory. Therefore, subjective analysis should be used.

If no visible defects (items 1-4) are found, a couple of test images should be taken. Generally, a well-illuminated typical indoor scene, such as the one in Figure "Good image taken indoors", can be used as a target. The main considerations are:

- The camera module has to be given time to focus correctly. Correct focusing is normally indicated with a flashing icon or green bracket in the viewfinder. During focusing, the image in the viewfinder moves slightly back and fourth, this is normal and shows that the lens unit is moving. During the movement a faint sound can be heard from the camera head.
- The protection window has to be clean.
- The amount of light (300 – 600 lux (bright office lighting)) is sufficient.
- The scene should contain, for example, small objects for checking sharpness. Their distance should be 1 – 2 meters.
- If possible, compare the image to another image of the same scene, taken with a different device. Note that the reference device has to be a similar Nokia phone.

There are several conditions in which AF operation is challenging for the camera module, these include:

- Low light scenes and night mode
- Scenes with low contrast
- Fast-moving objects

Under low light and night mode the AF function is slower than under good light, it may even fail to find correct focus position. Low contrast scenes and fast moving objects may also slow down or cause AF to fail. This is normal operation, and is not a cause to replace camera.

The operation of AF can be tested by taking images of objects at different distances. Good distances are 20 cm, 60 cm and infinity (>3 m). Any LED or xenon flashes should not be used while taking the images.

The taken images should be analysed on PC screen at 100% scaling simultaneously with reference image. Pay attention to the computer display settings; at least 65000 colours (16-bit) have to be used. 256 (8-bit) colour setting is not sufficient, and true colour (24 bit, 16 million colours) or 32-bit (full colour) setting is recommended.

If there appears to be a clearly noticeable difference between the reference image and the test images, the module might have a faulty lens. In this case, the module should be changed. Always recheck the resolution after changing the camera module. If a different module produces the same result, the fault is probably in the camera window. Check the window by looking carefully through it when replacing the module. As references Figure "Good image taken indoors" and Figure "Good image taken outdoors" can be used. Another possibility is to use a service point comparison phone, if available.

Effects of dirty or defective camera lens protection window

The following series of images demonstrates the effects of fingerprints on the camera protection window.

> **Note:** The effects of any dirt in images can vary very much; it may be difficult to judge if the window has been dirty when some image has been taken or if something else has been wrong. That is why the cleanness of the protection window should always be checked and the window should be wiped clean with a suitable cloth.

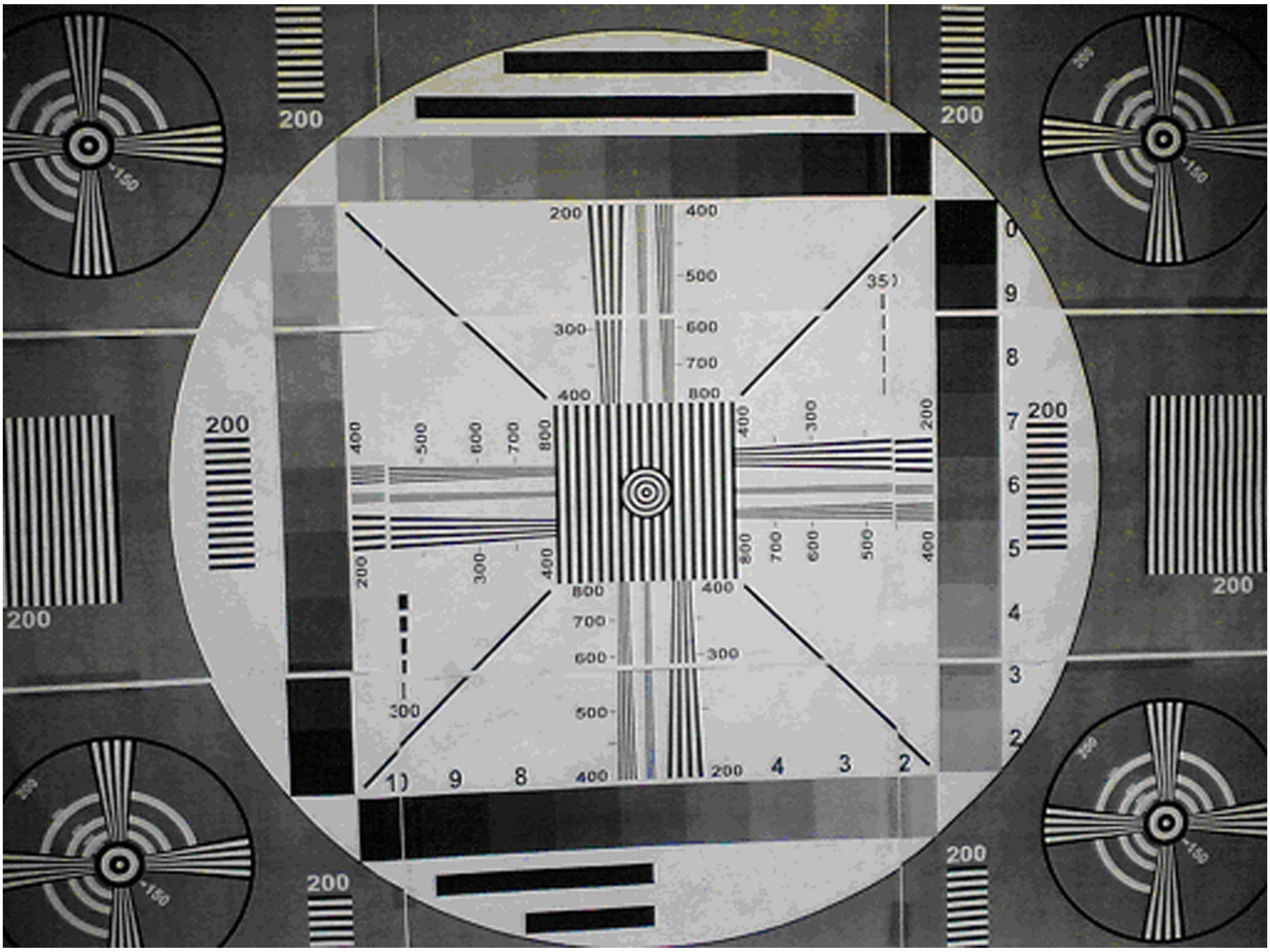


Figure 83 Image taken with clear protection window

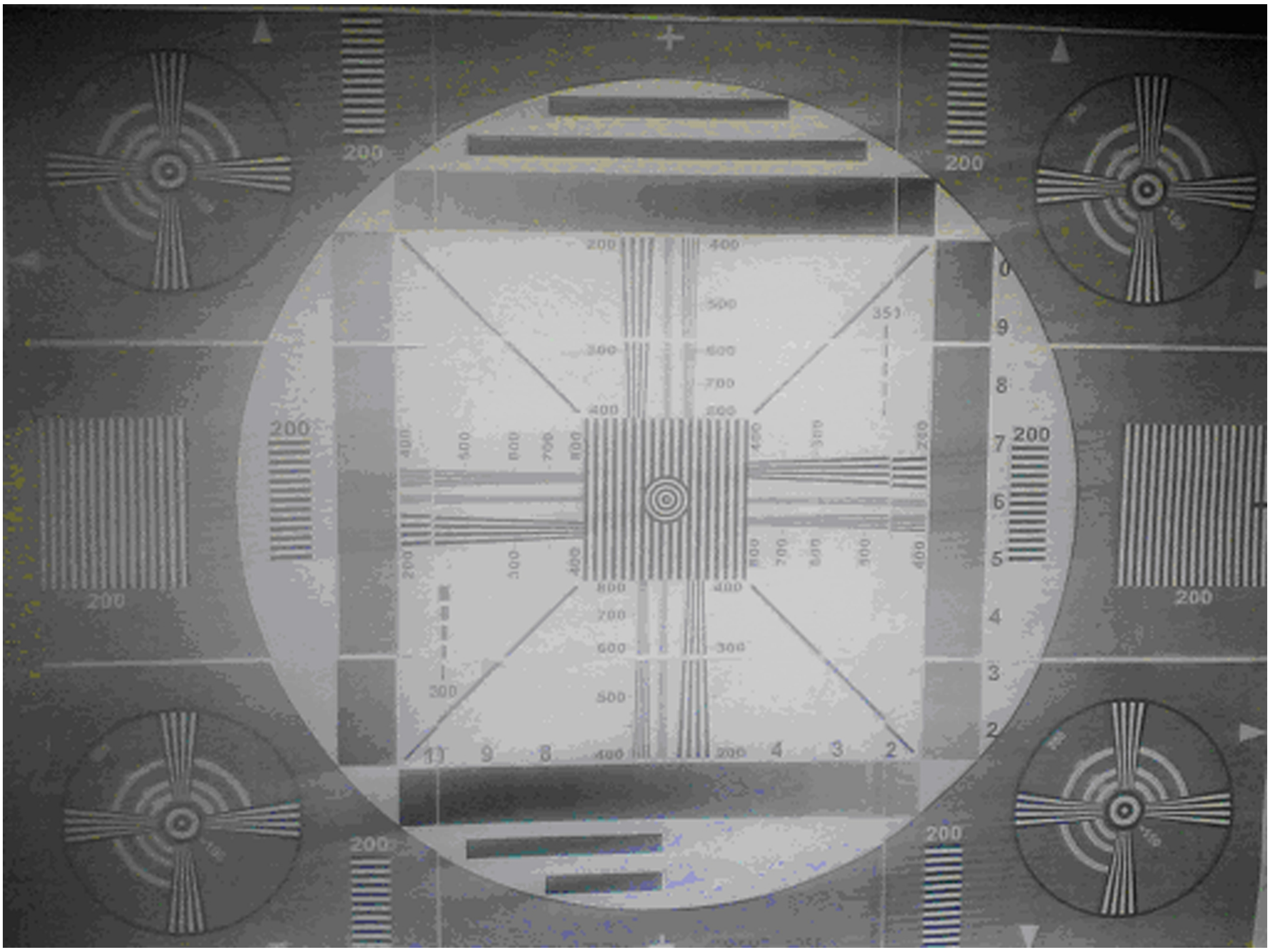


Figure 84 Image taken with greasy protection window

Bright point light sources might cause images that have flares around the light source if the protection window is dirty. A smeared fingerprint may be hard to see on the protective window but if will affect the image quality. These flares can be avoided by cleaning the window with a suitable cloth.

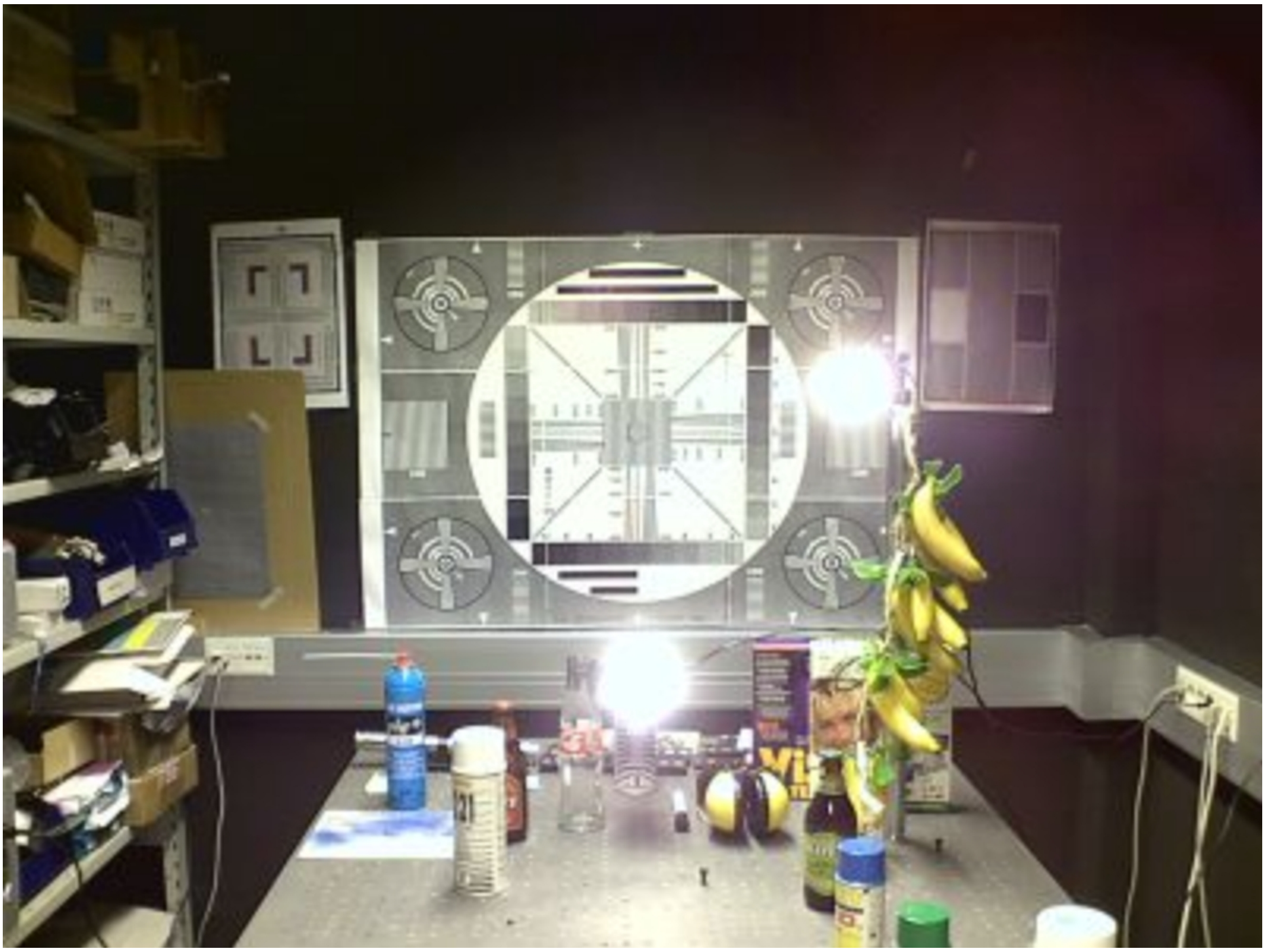


Figure 85 Image of point light sources taken with a clean protective window

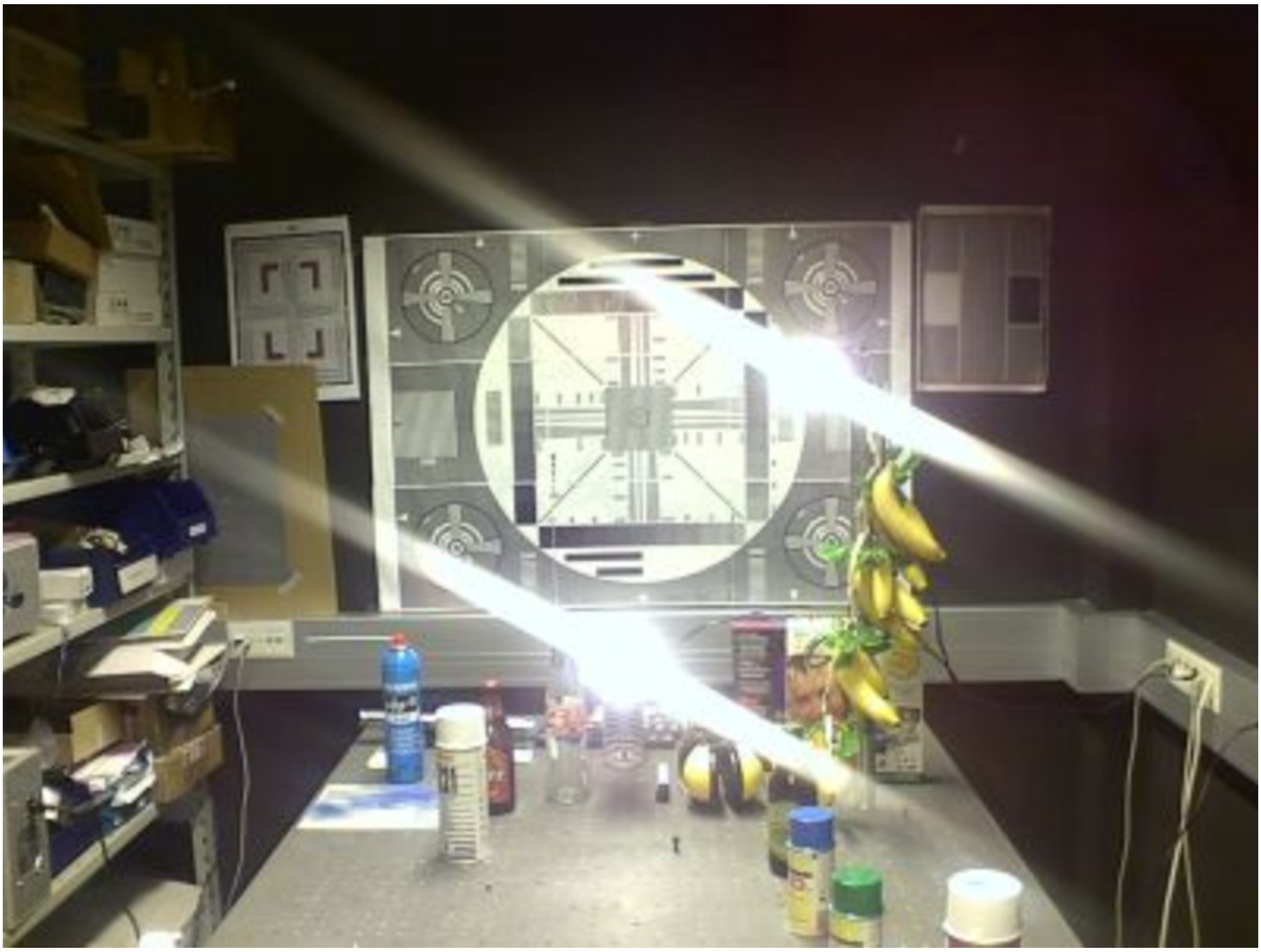


Figure 86 Image of point light sources taken with a dirty (finger print) protective window

Image bit errors

Bit errors are image defects caused by data transmission errors between the camera module and the phone baseband and/or errors inside the camera module.

Usually bit errors can be easily detected in images, and they are best visible in full resolution images. A good practice is to use a uniform white test target when analysing these errors. The errors are clearly visible, colourful sharp dots or lines in camera images. See the following figure.

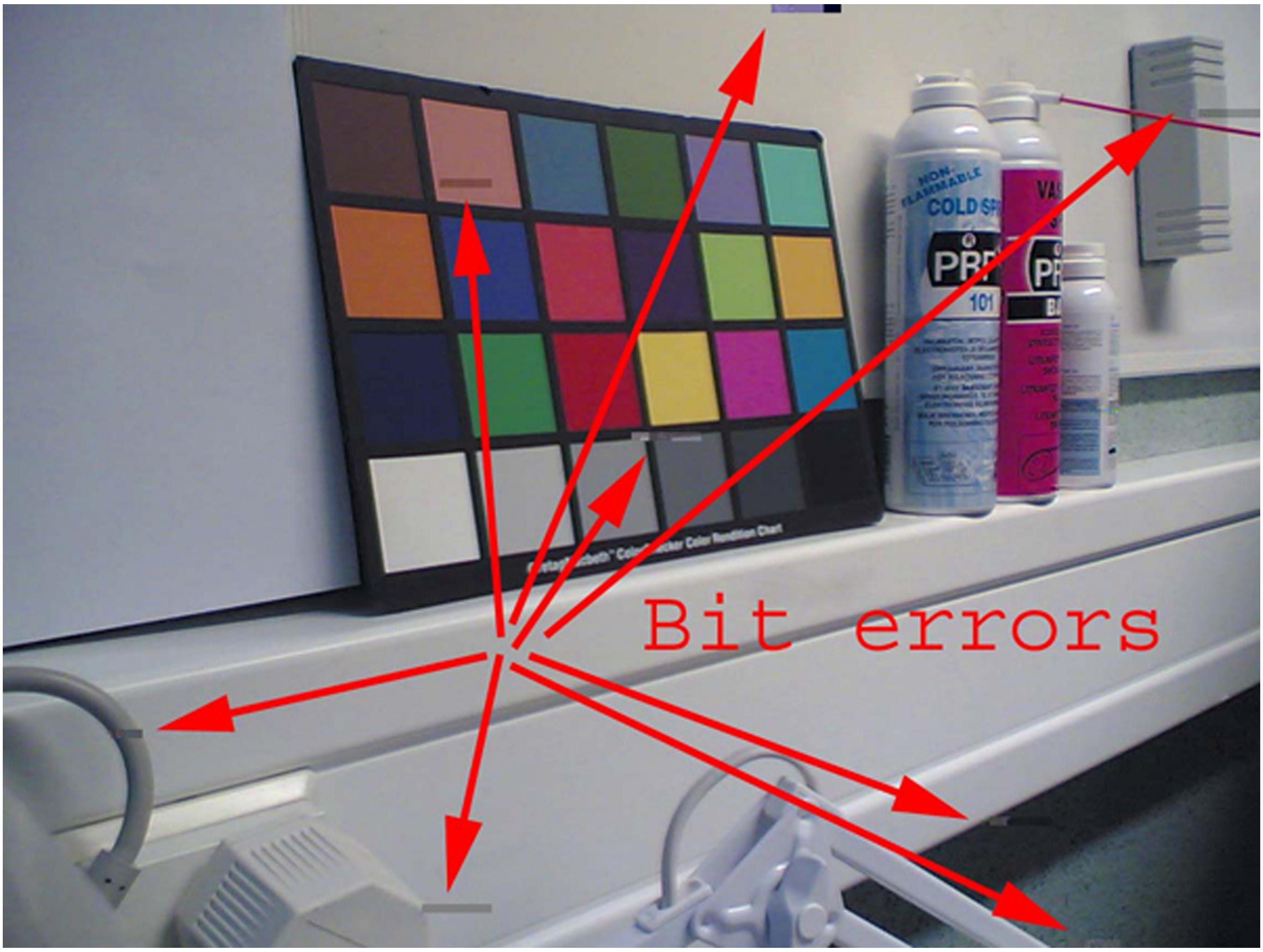


Figure 87 Bit errors caused by JPEG compression

One type of bit error is a lack of bit depth. In this case, the image is almost totally black under normal conditions, and only senses something in very highly illuminated environments. Typically this is a contact problem between the camera module and the phone main PWB. You should check the camera assembly and connector contacts.

If the fault is in the camera module, bit errors are typically visible only when using some specific image resolution. For example, in case of a viewfinder fault, the error might exist but is not visible in a full size image.

Faulty pixels in images

Faulty pixels are pixels that do not respond to light in the same way as the pixels around them. There are three main types of faulty pixels, dead, stuck and hot pixels.

Dead pixels are always black or significantly darker than their surrounding. Dead pixels appear as black spots in all lightning conditions. Camera modules producing images with dead pixels that are clearly noticeable should be replaced.

If the pixel remains always saturated to its maximum value it is stuck. Stuck pixels may appear as red, green, blue or white spots in all lightning conditions. Camera modules producing images with one or more stuck pixels should be replaced.

Hot pixels are pixels that easily saturate in dim light conditions. It is normal to get a lot of noise and hot pixels in night conditions or otherwise dark conditions. The hot pixels should disappear when the ambient light is increased, but may still appear in darker areas of an otherwise well illuminated scene.

When examining an image for defect pixels test images should be viewed as 100% enlargements on a PC monitor.

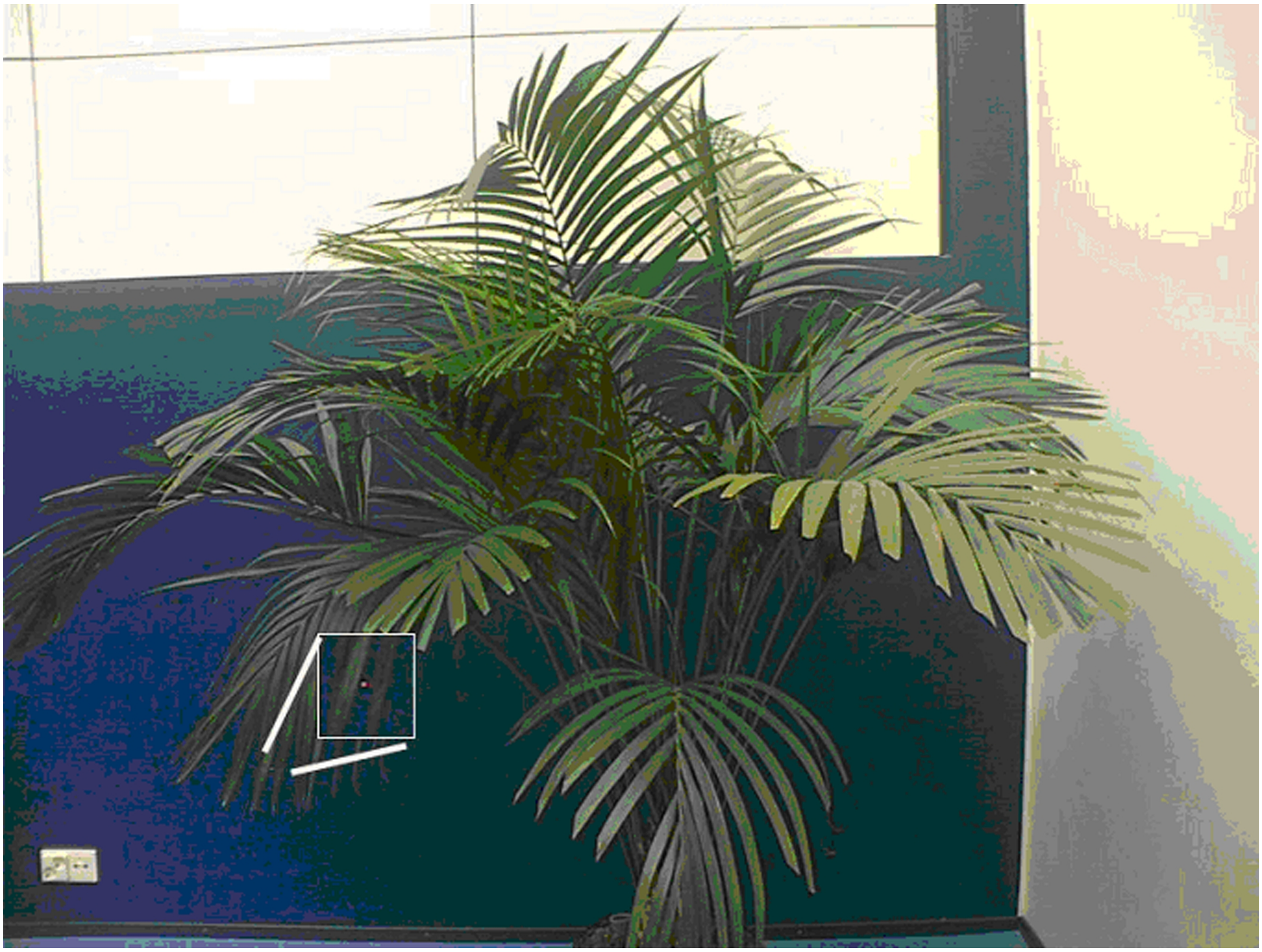


Figure 88 Enlargement of a hot pixel

Flash photography problems

Use of flash device may affect the image in many ways.

- White balance errors. The image may get a wrong tone due to mixing of flash colour temperature and ambient lightning. This is unwanted but normal feature.
- Dust reflections. Dust or water drops in front of the flash unit may reflect strongly to the camera sensor. See the following figure.

More detailed information of flash photography problems can be found in the document “LED flash service manual”.

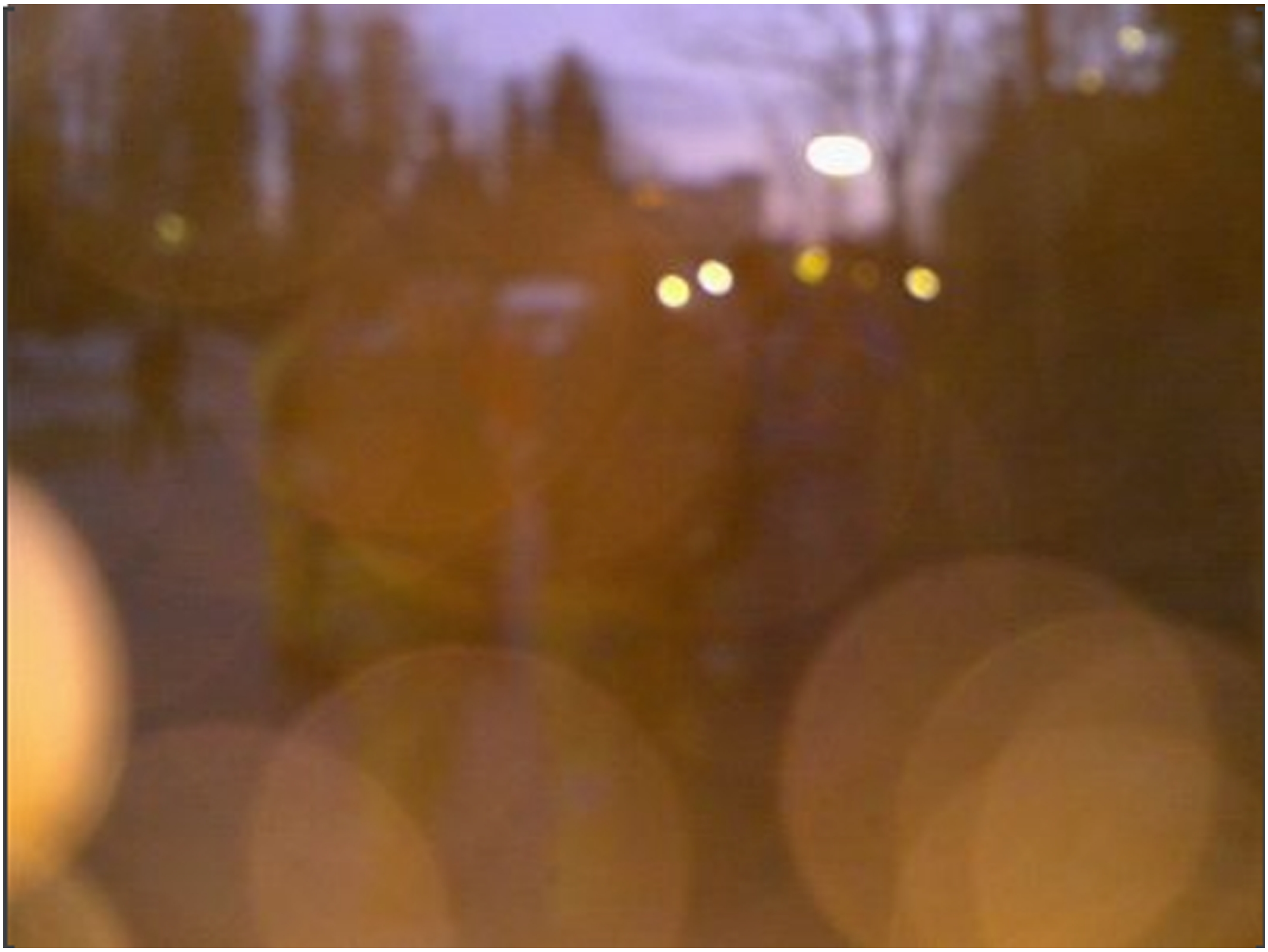


Figure 89 Light from the flash has reflected on particles in front of the camera

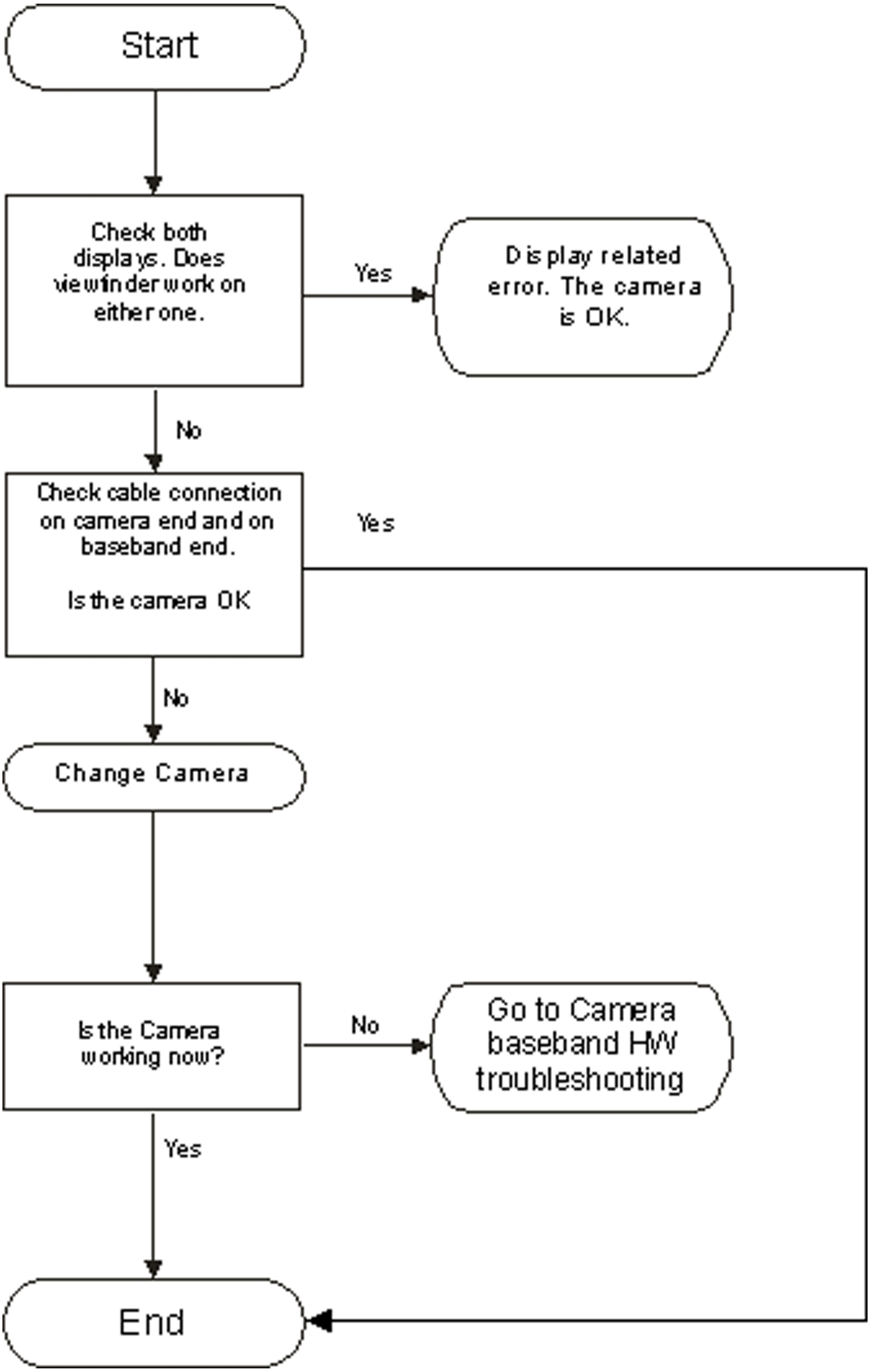
Camera troubleshooting flowcharts

Camera hardware failure message troubleshooting

Context

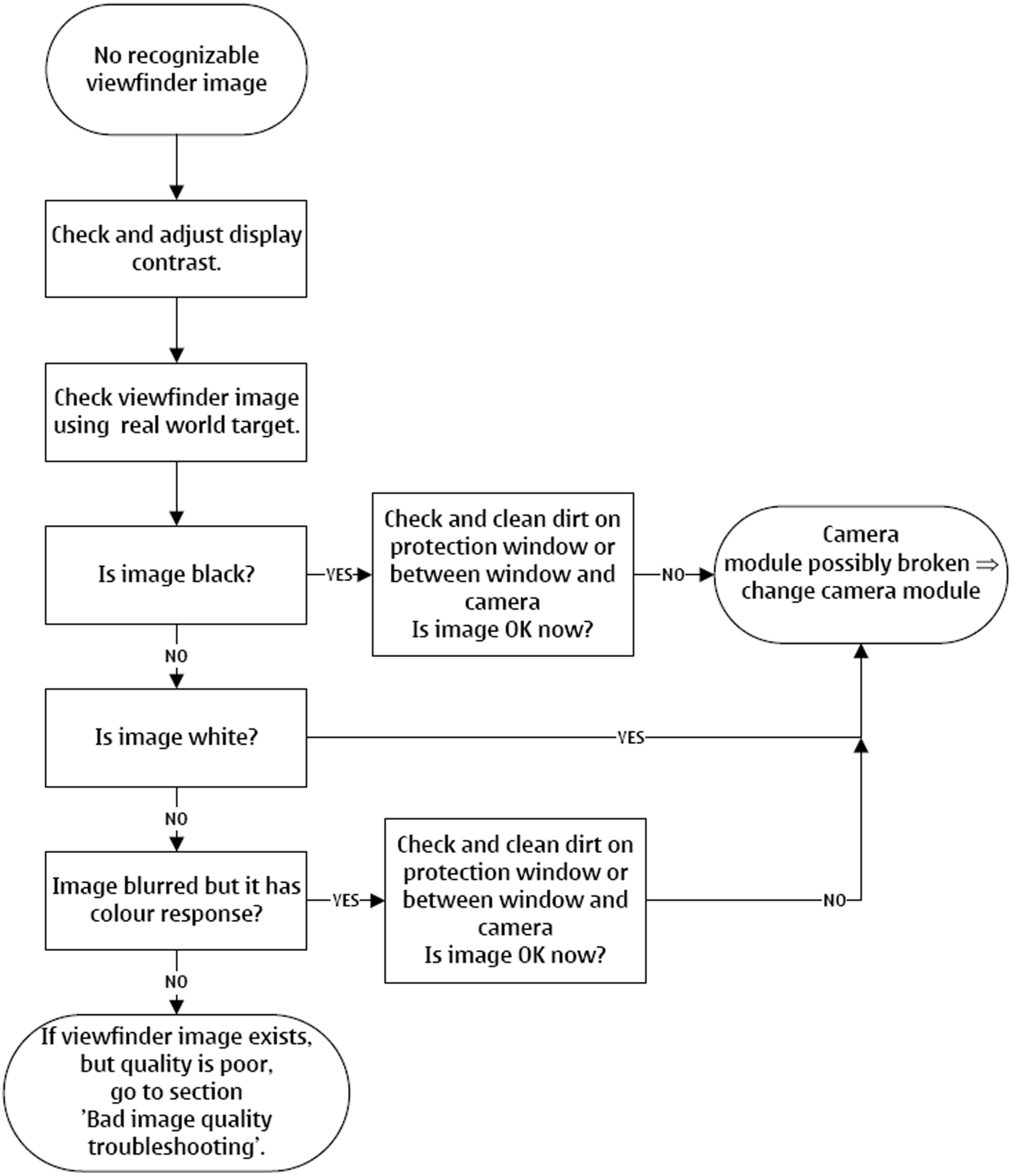
If you get a hardware failure message when using the camera, follow the next troubleshooting flowchart.

Troubleshooting flow


Start
Check both displays. Does viewfinder work on either one.
Yes
Display related error. The camera is OK.
No
Check cable connection on camera end and on baseband end.
Is the camera OK
Yes
No
Change Camera
Is the Camera working now?
No
Go to Camera baseband HW troubleshooting
Yes
End

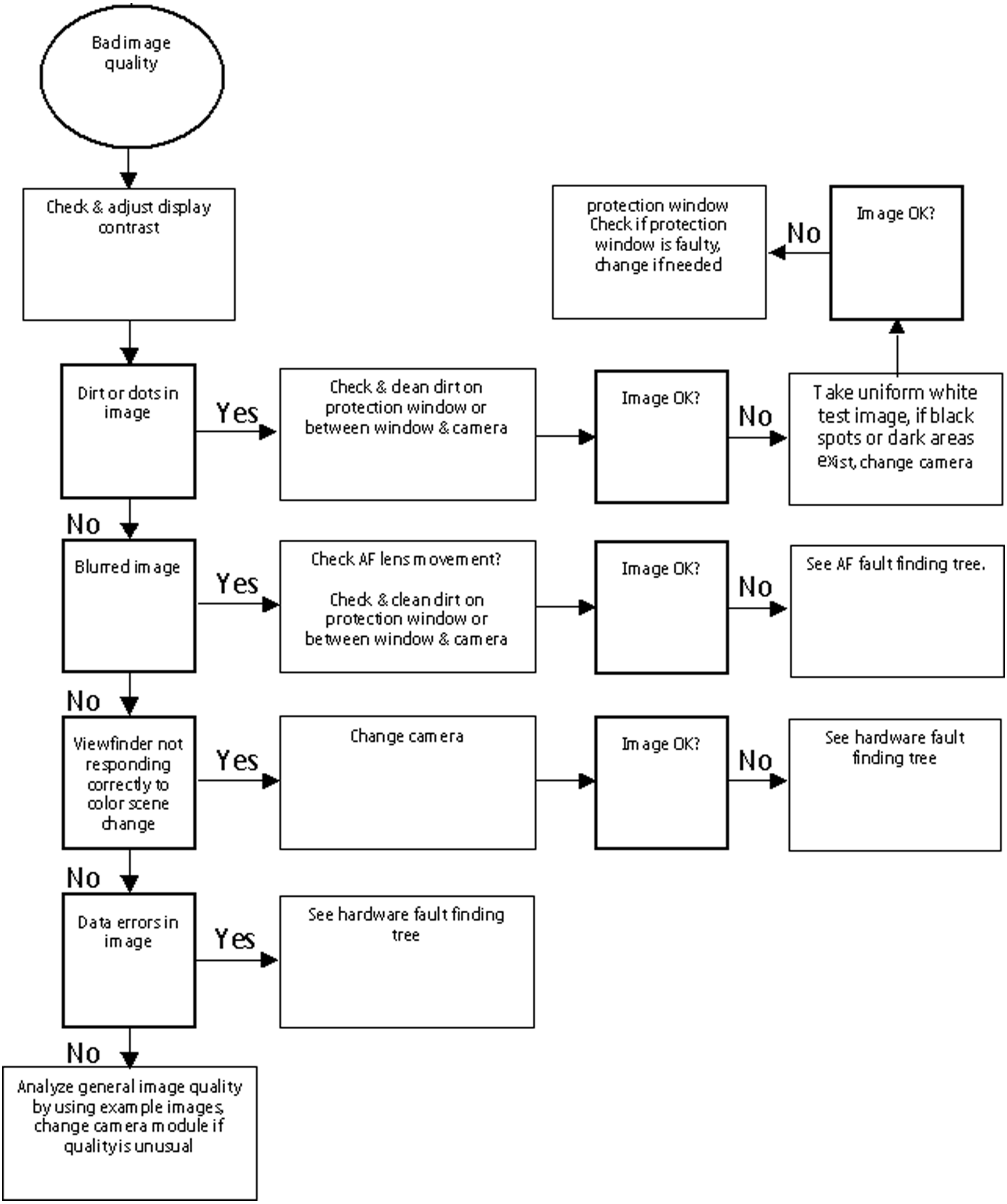
Camera viewfinder troubleshooting

Troubleshooting flow


No recognizable viewfinder image
Check and adjust display contrast.
Check viewfinder image using real world target.
Is image black?
YES
Check and clean dirt on protection window or between window and camera
Is image OK now?
NO
Camera module possibly broken ⇒ change camera module
NO
Is image white?
YES
NO
Image blurred but it has colour response?
YES
Check and clean dirt on protection window or between window and camera
Is image OK now?
NO
NO
If viewfinder image exists, but quality is poor, go to section 'Bad image quality troubleshooting'.

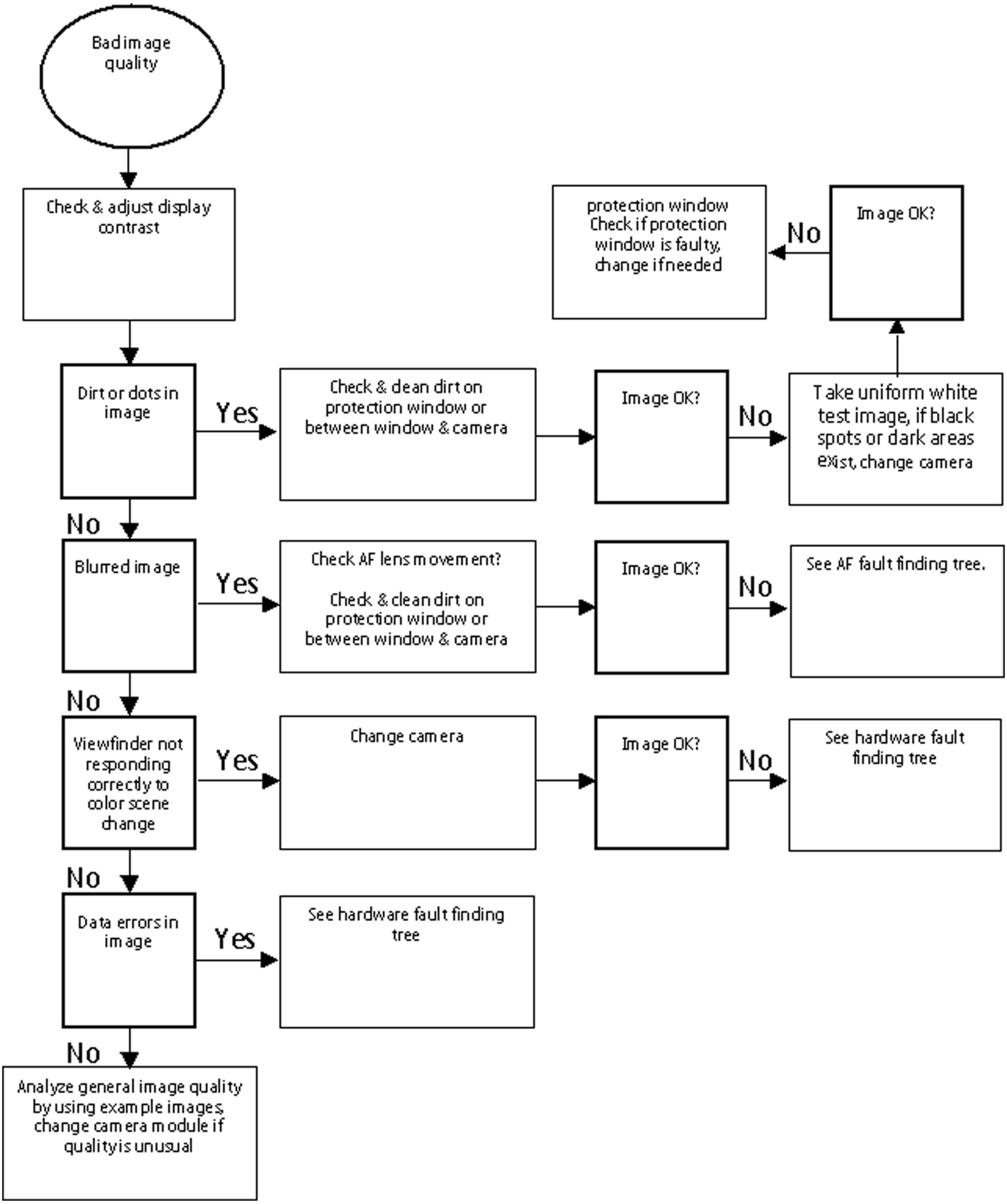
Bad camera image quality troubleshooting

Troubleshooting flow


Bad image quality
Check & adjust display contrast
Dirt or dots in image
Yes
Check & clean dirt on protection window or between window & camera
Image OK?
No
Take uniform white test image, if black spots or dark areas exist, change camera
Image OK?
No
protection window Check if protection window is faulty, change if needed
No
Blurred image
Yes
Check AF lens movement?
Check & clean dirt on protection window or between window & camera
Image OK?
No
See AF fault finding tree.
No
Viewfinder not responding correctly to color scene change
Yes
Change camera
Image OK?
No
See hardware fault finding tree
No
Data errors in image
Yes
See hardware fault finding tree
No
Analyze general image quality by using example images, change camera module if quality is unusual

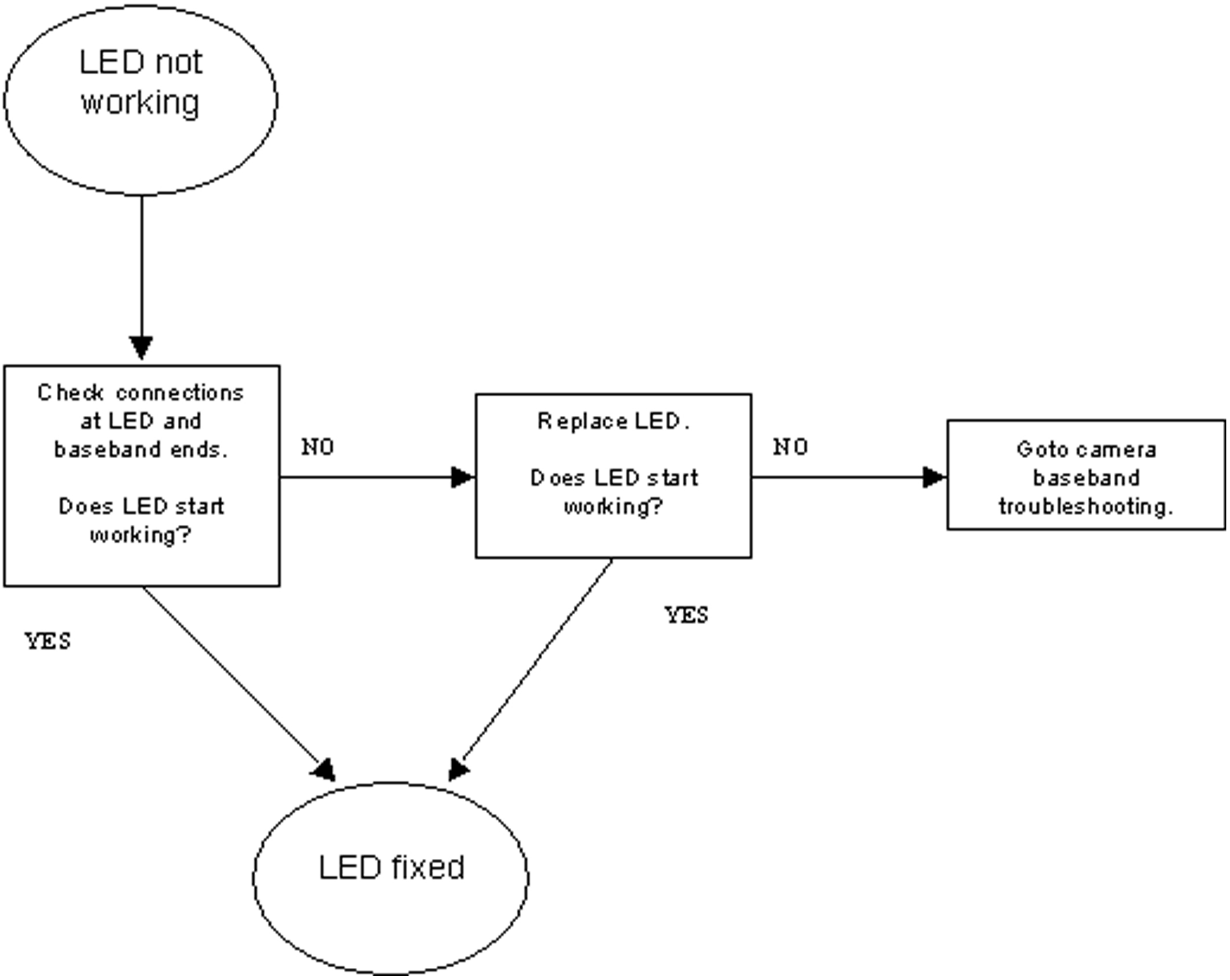
Bad camera image quality troubleshooting

Troubleshooting flow


Bad image quality
Check & adjust display contrast
Dirt or dots in image
Yes
Check & clean dirt on protection window or between window & camera
Image OK?
No
Take uniform white test image, if black spots or dark areas exist, change camera
Image OK?
No
protection window Check if protection window is faulty, change if needed
No
Blurred image
Yes
Check AF lens movement?
Check & clean dirt on protection window or between window & camera
Image OK?
No
See AF fault finding tree.
No
Viewfinder not responding correctly to color scene change
Yes
Change camera
Image OK?
No
See hardware fault finding tree
No
Data errors in image
Yes
See hardware fault finding tree
No
Analyze general image quality by using example images, change camera module if quality is unusual

Camera LED flash troubleshooting

Troubleshooting flow


LED not working
Check connections at LED and baseband ends.
Does LED start working?
NO
Replace LED.
Does LED start working?
NO
Goto camera baseband troubleshooting.
YES
YES
LED fixed

9 — System Module

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Figure 97 MMC interface....9–18
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Baseband description

System module block diagram

The device consists of three different main units: engine unit, display unit and camera unit. The engine unit contains most of the baseband and RF components. The display unit contains main display, sub-display and associated components. The camera unit consists of camera head, flash led and associated components.

Table below lists the main HW modules inside the main units and Figure 1 shows the interconnections and block diagram of the units.

Name of module	Type code	Notes
Engine Module	1HU	Engine PWB with components
Display PWB	1LB	Display PWB with components. Part of the Display frame assembly.
Engine Flex	1JS	Keyboard flex with components. Part of the Engine UI assembly.
Display FPC	1JT	Display unit flex with components. Part of the Display frame assembly.
Camera Flex	1JU	Camera unit flex with components. Part of the Audio module.
Camera Module		Unagi 2MP camera head
Main Display Module		K2
2nd Display Module		Jordan

Note: In this description, user interface HW covers display, camera, keyboard, keyboard backlight and ALS.

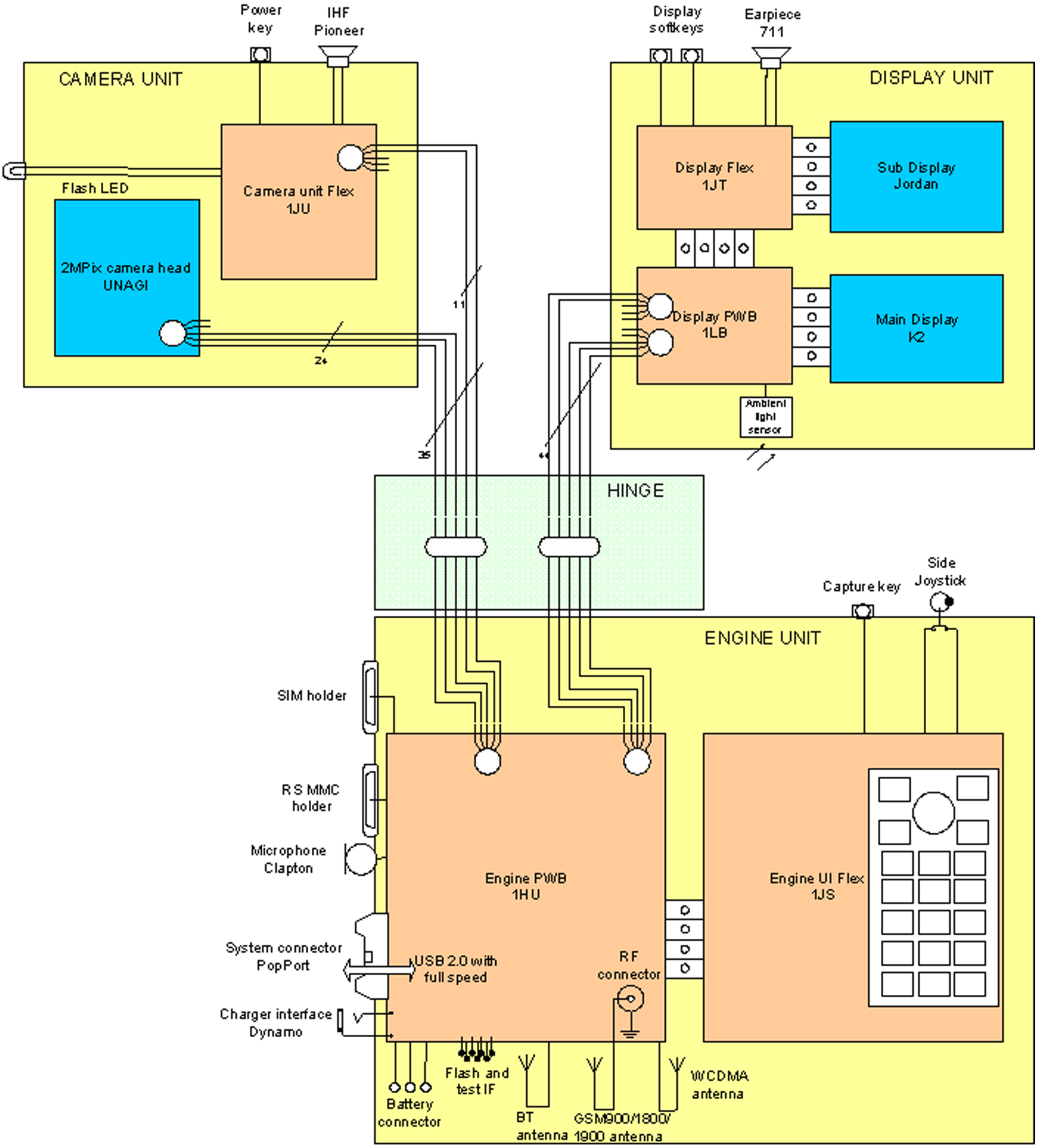

Power key
IHF Pioneer
CAMERA UNIT
Flash LED
Camera unit Flex 1JU
2MPix camera head UNAGI
11
24
35
44
Display softkeys
Earpiece 711
DISPLAY UNIT
Display Flex 1JT
Sub Display Jordan
Display PWB 1LB
Main Display K2
Ambient light sensor
HINGE
Capture key
Side Joystick
ENGINE UNIT
SIM holder
RS MMC holder
Microphone Clapton
System connector PopPort
Charger interface Dynamo
Engine PWB 1HU
USB 2.0 with full speed
RF connector
Engine UI Flex 1JS
Battery connector
Flash and test IF
BT antenna
GSM900/1800/1900 antenna
WCDMA antenna

Figure 90 Internal and external connections diagram

Baseband functional description

Digital baseband consists of ISA based modem and SYMBIAN based application sections. Modem functionality is in RAP3G and Helen2/3 acts as a platform for SYMBIAN applications.

Modem section consists of RAP3G ASIC with NOR FLASH and SDRAM memory as the core. RAP3G supports cellular protocols of WCDMA (3GPP R-4) and GSM (minimum EDGE glass 10, GPRS phase2). Modem SDRAM memory have 64Mbits of memory and NOR flash have 64Mbits of memory. RAP3G operates with the system clock of 38.4 MHz, which comes from the VCTCXO.

Application section includes Helen3 ASIC with DDR/NAND combo memory as the core. Stacked DDR/NAND application memory has 512Mbits of DDR memory and 512Mbits of flash memory. Helen3 uses 19.2MHz clock, which comes from the RAP3G divided by two from the 38.4 MHz system clock.

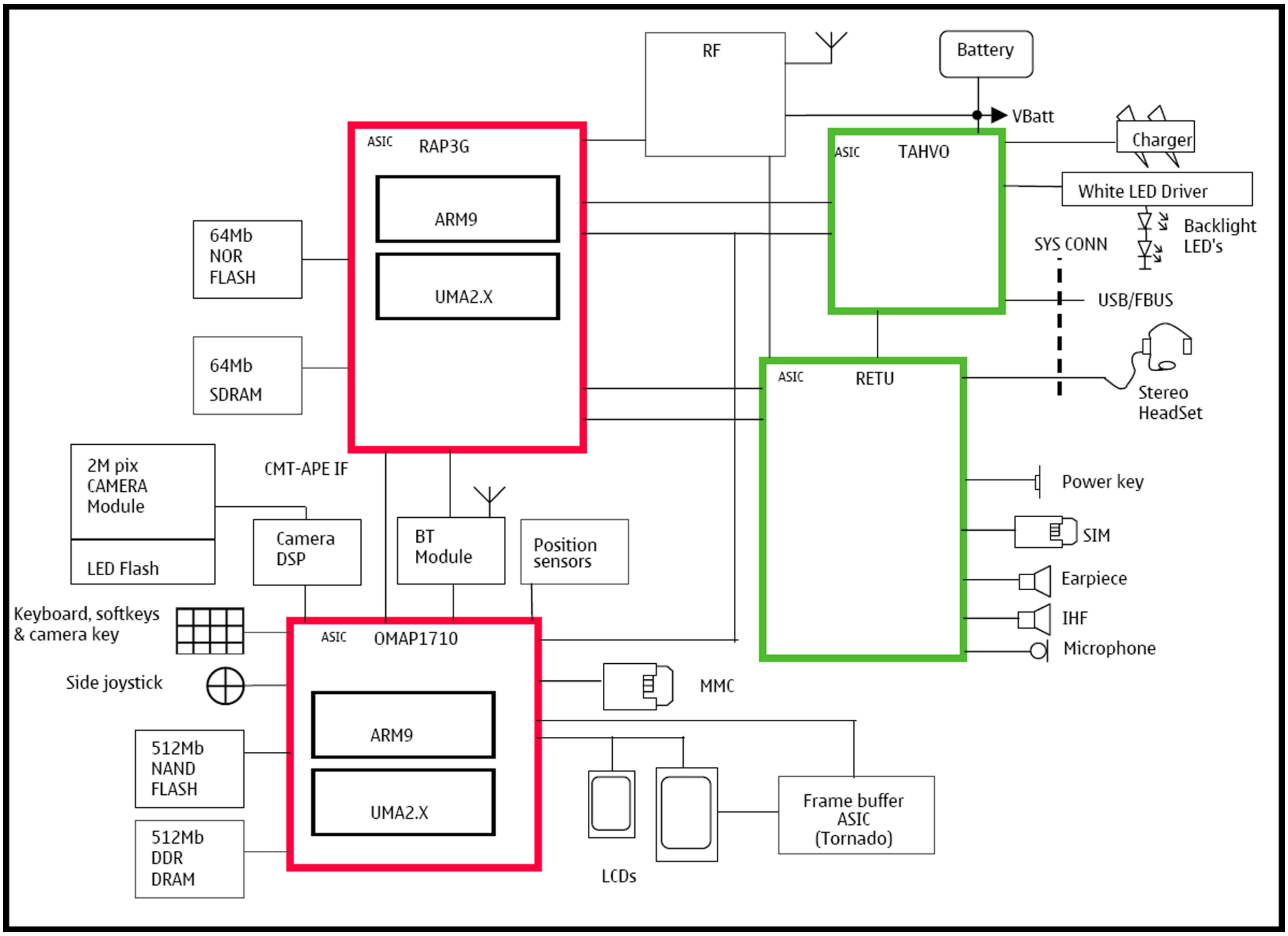

RF
Battery
VBatt
Charger
ASIC
RAP3G
ARM9
UMA2.X
ASIC
TAHVO
White LED Driver
Backlight
LED's
SYS CONN
USB/FBUS
64Mb
NOR
FLASH
64Mb
SDRAM
ASIC
RETU
Stereo
HeadSet
2M pix
CAMERA
Module
LED Flash
CMT-APE IF
Camera
DSP
BT
Module
Position
sensors
Power key
SIM
Earpiece
IHF
Microphone
Keyboard, softkeys
& camera key
Side joystick
ASIC
OMAP1710
ARM9
UMA2.X
MMC
512Mb
NAND
FLASH
512Mb
DDR
DRAM
Frame buffer
ASIC
(Tornado)
LCDs

Figure 91 Functional block diagram

Helen3 processor (OMAP1710) is also called as an application ASIC because it is processing application SW and handles the UI SW. It consists of OMAP3.3 and peripheral subsystems like camera-, display- and keyboard driver blocks.

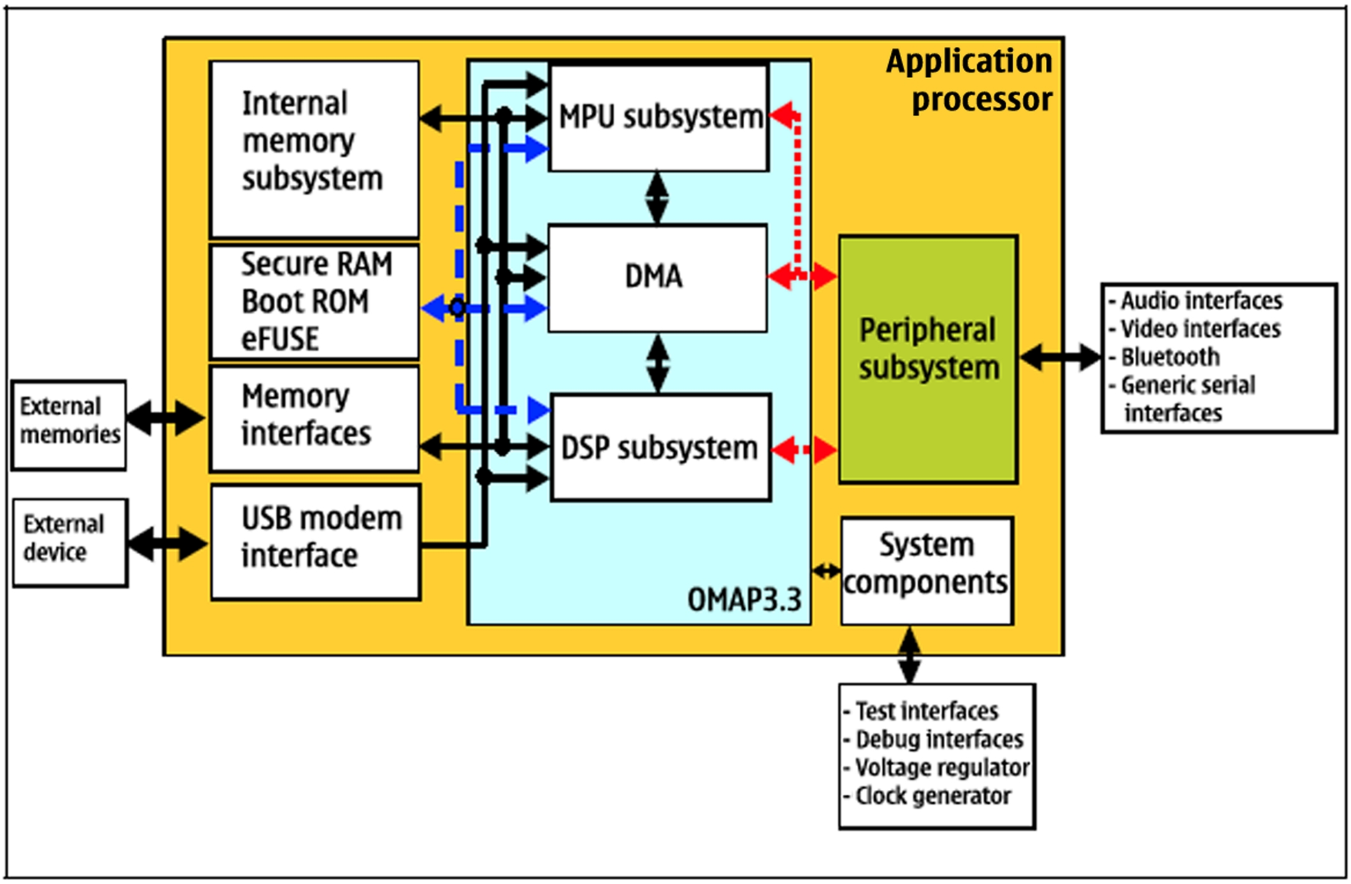

Application processor
Internal memory subsystem
Secure RAM
Boot ROM
eFUSE
Memory interfaces
USB modem interface
MPU subsystem
DMA
DSP subsystem
OMAP3.3
Peripheral subsystem
System components
External memories
External device
- Audio interfaces
- Video interfaces
- Bluetooth
- Generic serial interfaces
- Test interfaces
- Debug interfaces
- Voltage regulator
- Clock generator

Figure 92 Helen3 high level block diagram

OMAP3.3 consists of ARM926 (MPU subsystem), TMS320C55x (DSP subsystem), DMA and OMAP3.3s internal peripherals.

Helen3s MPU subsystem is based on an ARM926EJ. MPU is able to perform most of the application operations on the chip.

System DMA: This component is mainly used to help the MPU and DSP perform data memory transfer-specific tasks, leaving more available MIPS for both processors.

The DSP subsystem is based on a TMS320C55x™ DSP core, which is responsible for intensive data computing tasks like real-time audio and video handling on application side. E.g. voice recording.

Internal memory subsystem: This subsystem is composed of a single port SRAM.

Secure modules: OMAP1710 contains a set of several components, including ROM, a single port SRAM, and eFUSE cells. These components enable the system to support secure applications.

Memory interfaces: The memory interfaces define the system memory access organization of OMAP1710.

USB & modem interface: These two modules enable the platform to support a universal serial link and a dedicated modem interface, enabling a high data transfer rate between the modem and the application chip.

System components: System components are group of modules responsible for managing system interactions such as interrupt, clock control and idle.

Peripheral subsystem: The peripheral subsystem defines all the components used to interface OMAP1710 with specific external devices such as camera, keyboard, display etc.

Absolute maximum ratings

Signal	Min	Nom	Max	Unit	Notes
Battery voltage (idle)	-0.3		+4.5	V	Battery voltage maximum value is specified during charging is active
Battery voltage (Call)	+3.2		+4.3	V	Battery voltage maximum value is specified during charging is active
Charger input voltage	-0.3		+16V	V	
Back-Up supply voltage	0	2.5	2.6	V	Maximum capacity of the backup power supply assumed to be 15 µAh.

Phone modes of operation

Mode	Description
NO_SUPPLY	(dead) mode means that the main battery is not present or its voltage is too low (below N2200 master reset threshold) and that the back-up battery voltage is too low.
BACK_UP	The main battery is not present or its voltage is too low but back-up battery voltage is adequate and the 32 kHz oscillator is running (RTC is on).
PWR_OFF	In this mode (warm), the main battery is present and its voltage is over N2200 master reset threshold. All regulators are disabled, PurX is on low state, the RTC is on and the oscillator is on. PWR_OFF (cold) mode is almost the same as PWR_OFF (warm), but the RTC and the oscillator are off.
RESET	RESET mode is a synonym for start-up sequence. In this mode certain regulators are enabled and after they and RFClk have stabilized, the system reset (PurX) is released and PWR_ON mode entered. RESET mode uses 32 kHz clock to count the REST mode delay (typically 16 ms).
SLEEP	SLEEP mode is entered only from PWR_ON mode with the aid of SW when the system's activity is low. There are in principle three different sleep modes: • Application processor sleep • RAP sleep • Application processor and RAP sleep (deep sleep) In SLEEP mode N2200's regulators VIO, VDRAM, VSIM1, VSIM2, VAUX and Vana are in low quiescent current mode (output voltages still present but regulators will not give as much current out). Other regulators including VR1 supplying system clock oscillator are disabled. In SLEEP mode, N2300 VCORE SMPS regulator is in low quiescent current mode (if sleep mode is not internally disabled). Linear regulator VOUT state depends on the accessory connected to the system connector, if there is any.
FLASHING	FLASHING mode is for SW downloading.

Voltage limits

Parameter	Description	Value
VMSTR	Master reset threshold (N2200)	2.2V (typ.)

Parameter	Description	Value
VMSTR+	Threshold for charging, rising (N2300)	2.1V (typ.)
VMSTR-	Threshold for charging, falling (N2300)	1.9V (typ.)
VCOFF+	Hardware cutoff (rising)	2.9V (typ.)
VCOFF-	Hardware cutoff (falling)	2.6V (typ.)
SWCOFF	SW cutoff limit	~3.2V

The master reset threshold controls the internal reset of N2200 / (N2300). If battery voltage is above VMSTR, N2300's charging control logic is alive. Also, RTC is active and supplied from the main battery. Above VMSTR, N2300 allows the system to be powered on although this may not succeed due to voltage drops during start up. SW can also consider battery voltage too low for operation and power down the system.

Power key

The system boots up when power key is pressed (adequate battery voltage, VBAT, present).

Power down can be initiated by pressing the power key again (the system is powered down with the aid of SW). Power on key is connected to N2200 ASIC via PWRONX signal.

Power distribution

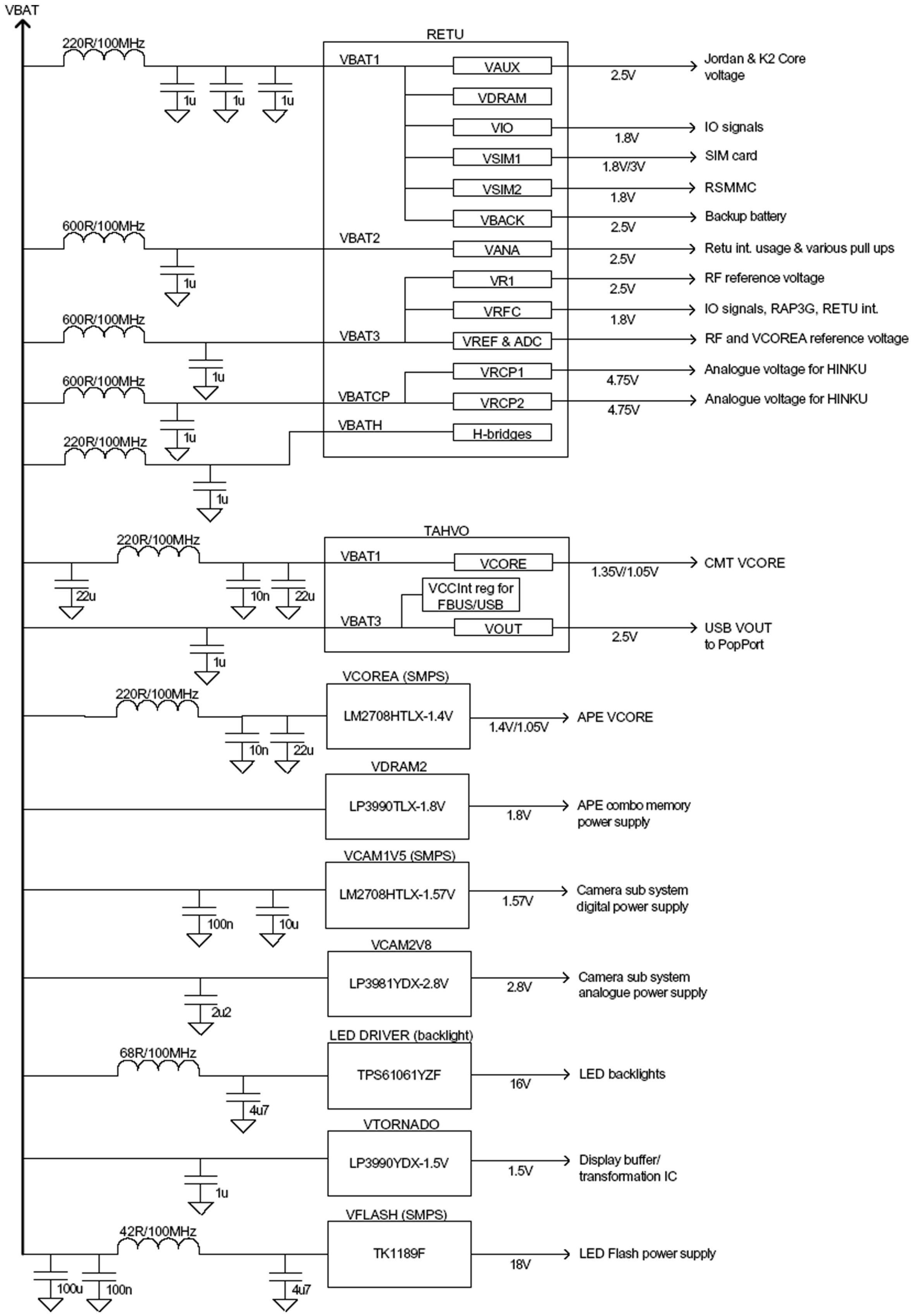

VBAT
RETU
220R/100MHz
1u
1u
1u
VBAT1
VAUX
VDRAM
VIO
VSIM1
VSIM2
VBACK
600R/100MHz
VBAT2
VANA
VR1
VRFC
600R/100MHz
VBAT3
VREF & ADC
VRCP1
600R/100MHz
VBATCP
VRCP2
VBATH
H-bridges
220R/100MHz
1u
2.5V
Jordan & K2 Core voltage
1.8V
IO signals
1.8V/3V
SIM card
1.8V
RSMMC
2.5V
Backup battery
2.5V
Retu int. usage & various pull ups
2.5V
RF reference voltage
1.8V
IO signals, RAP3G, RETU int.
RF and VCOREA reference voltage
4.75V
Analogue voltage for HINKU
4.75V
Analogue voltage for HINKU
TAHVO
220R/100MHz
22u
10n
22u
VBAT1
VCORE
VCCInt reg for FBUS/USB
VBAT3
VOUT
1.35V/1.05V
CMT VCORE
2.5V
USB VOUT to PopPort
VCOREA (SMPS)
220R/100MHz
LM2708HTLX-1.4V
10n
22u
1.4V/1.05V
APE VCORE
VDRAM2
LP3990TLX-1.8V
1.8V
APE combo memory power supply
VCAM1V5 (SMPS)
LM2708HTLX-1.57V
100n
10u
1.57V
Camera sub system digital power supply
VCAM2V8
LP3981YDX-2.8V
2u2
2.8V
Camera sub system analogue power supply
LED DRIVER (backlight)
68R/100MHz
TPS61061YZF
4u7
16V
LED backlights
VTORNADO
LP3990YDX-1.5V
1u
1.5V
Display buffer/ transformation IC
VFLASH (SMPS)
42R/100MHz
TK1189F
100u
100n
4u7
18V
LED Flash power supply

Figure 93 Power distribution diagram

Power supply components:

- RETU
- TAHVO
- Helen VCORE SMPS
- BT
- LDO
- camera LDO
- backlight SMPS

All the above are powered by the main battery voltage.

Battery voltage is also used on the RF side for power amplifiers (GSM PA & WCDMA PA) and for RF ASICs Hinku (Rx) & Vinku(Tx).

Discrete power supplies are used to generate 2.8V for BT, 1.5V for the camera module, 1.3V/1.5V for Helen3 and 18V for backlight LEDs.

The device supports both 1.8V/3V SIM cards which are powered by RETU / VSIM1. RETUs VSIM2 is used to power RS MMC 1.8V only. USB accessories which needs power from the device are powered by TAHVO / VOUT.

Because LED driver in TAHVO is not used, the external SMPS is used instead. External LED SMPS is still controlled by TAHVO and powered by battery voltage.

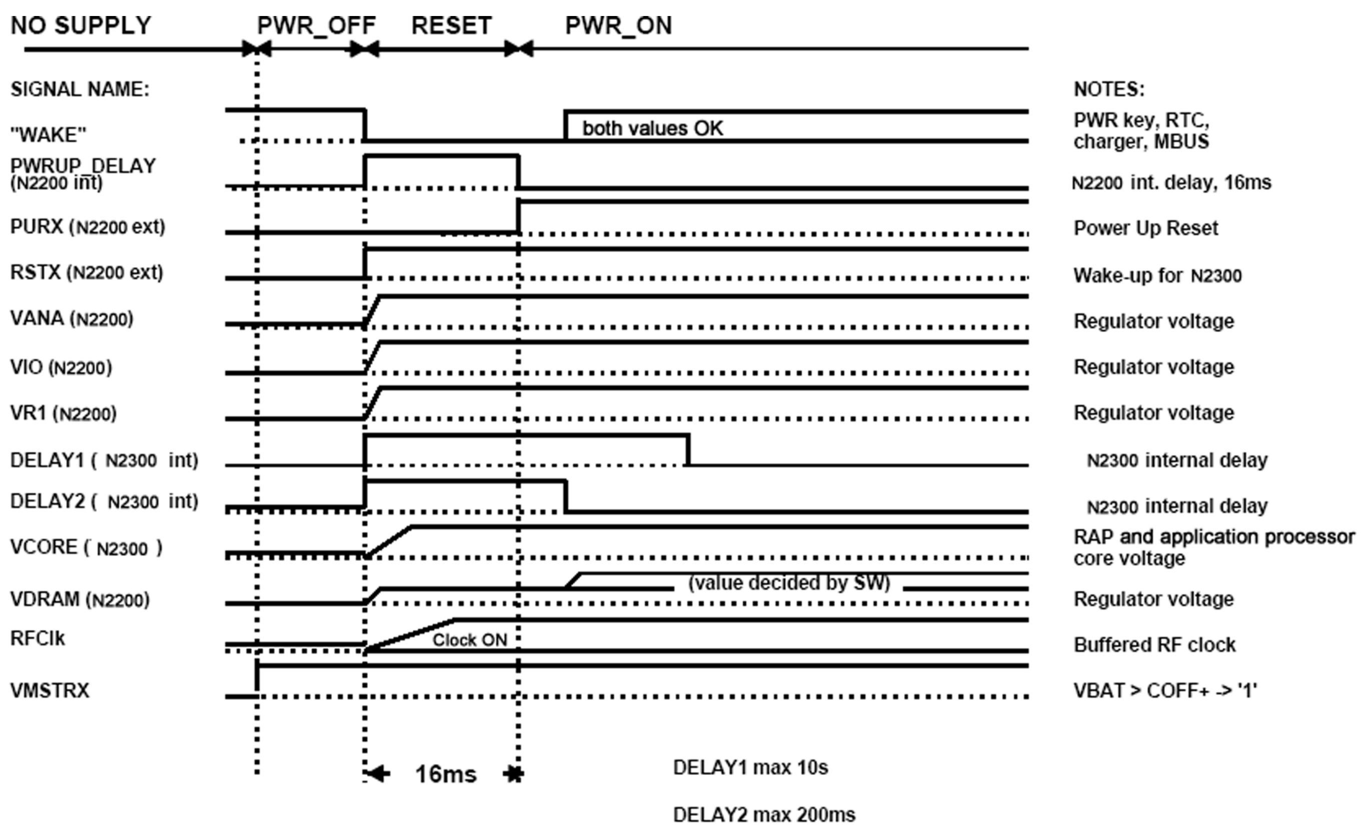
System power-up

After inserting the main battery, regulators started by HW are enabled. SW checks, if there is some reason to keep the power on. If not, the system is set to power off state by watchdog. Power up can be caused by the following reasons:

- Power key is pressed
- Charger is connected
- RTC alarm occurs
- MBUS wake-up

After that:

- Retu activates sleep clock and VANA, VDRAM, VIO and VR1 regulators.
- Voltage appearing at Retu’s RSTX pin is used for enabling Tahvo ASIC.
- Tahvo enables VCORE regulator and its internal RC-oscillator (600kHz).
- VCTCXO regulator is set ON and RF clock (main system clock) is started to produce.
- Retu will release PURX ~ 16ms after power up is enabled (the RF clock is then stable enough).
- Synchronizing clock (2.4MHz) for Tahvo is started to be produced. After PURX is released and two rising edges of 2.4MHz synchronous clock have been detected in SMPSClk input Tahvo is starting to use that instead of 600kHz internal RC-oscillator.
- HW start-up procedure has been finalized and the system is up and running. Now it is possible for SW to switch ON other needed regulators.


NO SUPPLY
PWR_OFF
RESET
PWR_ON
SIGNAL NAME:
NOTES:
"WAKE"
both values OK
PWR key, RTC, charger, MBUS
PWRUP_DELAY (N2200 int)
N2200 int. delay, 16ms
PURX (N2200 ext)
Power Up Reset
RSTX (N2200 ext)
Wake-up for N2300
VANA (N2200)
Regulator voltage
VIO (N2200)
Regulator voltage
VR1 (N2200)
Regulator voltage
DELAY1 (N2300 int)
N2300 internal delay
DELAY2 (N2300 int)
N2300 internal delay
VCORE (N2300)
RAP and application processor core voltage
VDRAM (N2200)
(value decided by SW)
Regulator voltage
RFClk
Clock ON
Buffered RF clock
VMSTRX
VBAT > COFF+ -> '1'
16ms
DELAY1 max 10s
DELAY2 max 200ms

DELAY1 is started to count from charger detection or detecting '1' in RSTX.
DELAY2 is started to count when '1' is detected in RSTX.
VDRAM is powered up to 1.8V at start and after SW starts, the decision whether to use 1.8V or 2.5V is done.

Figure 94 System start-up timing

Clocking scheme

In BB5.0, two main clocks are provided to the system: 38.4MHz RF clock produced by VCTCXO in RF section and 32.768kHz sleep clock produced by RETU with an external crystal.

RF clock is generated only when VCTCXO is powered on by RETU regulator. Regulator itself is activated by SleepX signals from both RAP3G and Helen3. When both CPUs are on sleep, RF clock is stopped.

RF clock is used by RAP3G that then provides (divided) 19.2MHz SysClk further to Helen3 and Tornado. There is a separate clock buffer for Tornado clock. Both RAPG and Helen3 have internal PLLs which then create clock signals for other peripheral devices/interfaces like RS MMC, SIM, CCP, I2C and memories.

32k Sleep Clock is always powered on after startup. Sleep clock is used by RAP3G and OMAP for low-power operation.

SMPS Clk is 2.4MHz clock line from RAP3G to Tahvo used for switch mode regulator synchronizing in active mode. In deep sleep mode, when VCTCXO is off, this signal is set to '0'-state.

BT Clk is 38.4MHz signal from Hinku ASIC to BT module.

CLK600 is 600KHz signal from Tahvo to APE VCORE SMPS. The clock source is internal RC oscillator in Tahvo (during the power-up sequence) or RAP3G SMPS Clk divided by 4 after the power-up sequence.

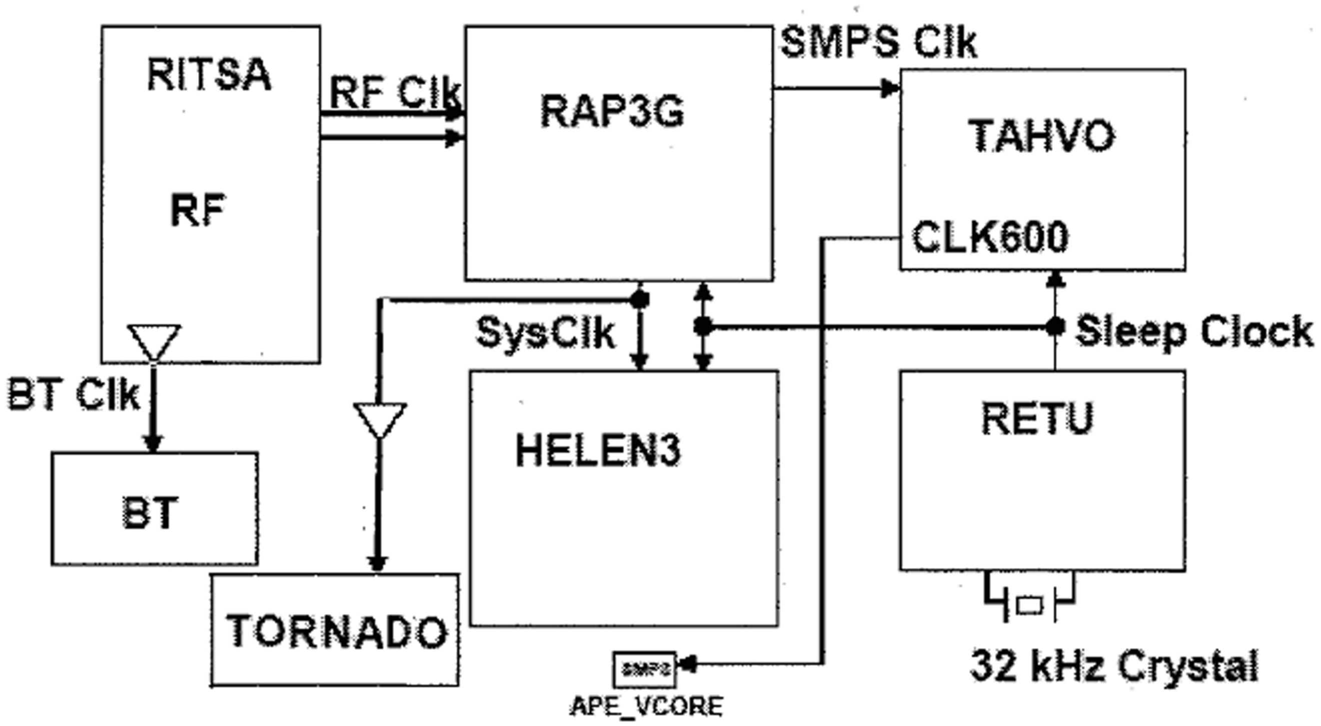


Figure 95 Clocking scheme

BRF6150 Bluetooth

Bluetooth provides a fully digital link for communication between a master unit and one or more slave units. The system provides a radio link that offers a high degree of flexibility to support various applications and product scenarios. Data and control interface for a low power RF module is provided. Data rate is regulated between the master and the slave.

The device Bluetooth is based on the BRF6150 BT ASIC.

The UART1 interface handles the transfer of control and data information between the application processor and the BT system (BRF6150).

The PCM interface is used for audio data transfer between RAP and the BT system (BRF6150).

USB

USB (Universal Serial Bus) provides a wired connectivity between a USB host PC and peripheral devices.

USB is a differential serial bus for USB devices. USB controller (RAP) supports USB specification revision 2.0 with full speed USB (12 Mbps). The device is connected to the USB host through the system connector. The USB bus is hot plugged capable, which means that USB devices may be plugged in/out at any time.

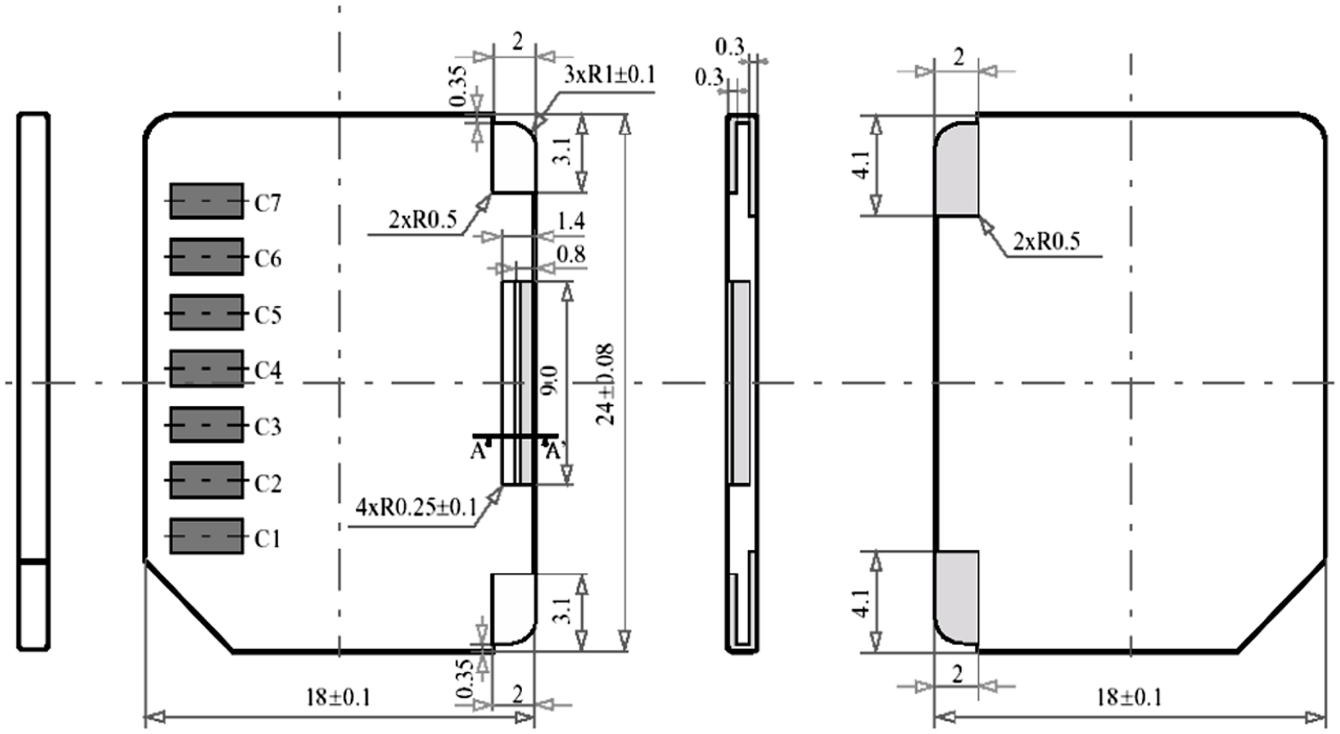
SIM interface

The device has one SIM (Subscriber Identification Module) interface. SIM interface consists of internal interface between RAP3G and Retu and an external interface between Retu and SIM contacts. SIM interface functionality is located in RAP3G while Retu takes care of power up/down, card detection, ATR counting and level shifting. For Retu external SIM IF connections, see SIM interface connections (page 9–36).

Retu handles SIM card detection and the detection method is based on the BSI line. Due to location of the SIM card removal of the battery causes quick power down of the SIM IF. The Retu SIM1 interface supports both the 1.8V and 3.0V SIM cards. SIM interface voltage is first 1.8V when the SIM card is inserted and if the card does not response to the ATR (Answer To Reset) 3V interface voltage is used. The data communication between the card and the phone is asynchronous half duplex and the clock supplied to cards is 1-5MHz, which is 3.2MHz by default (in GSM system). The data baud rate is SIM card clock frequency divided by 372 (by default), 64, 32 or 16.

RS MMC interface

The device has one slot for reduced size (24mm x 18mm x 1.4mm multimedia card. The device supports RS MMC hot insertion so it is possible to remove/insert the card when the phone is powered on.


2
0.35
3xR1±0.1
0.3
0.3
2
C7
C6
C5
C4
C3
C2
C1
2xR0.5
3.1
1.4
0.8
9.0
24±0.08
A
A
4xR0.25±0.1
4.1
2xR0.5
3.1
0.35
4.1
18±0.1
2
2
18±0.1

General Tolerance: ±0.1mm

All dimensions in millimeters

Figure 96 Reduced size MMC

RS MMC card is connected to the Helen3 processor MMC/SDIO2 (1.8V) interface. MMC interface is shown in the following figure:

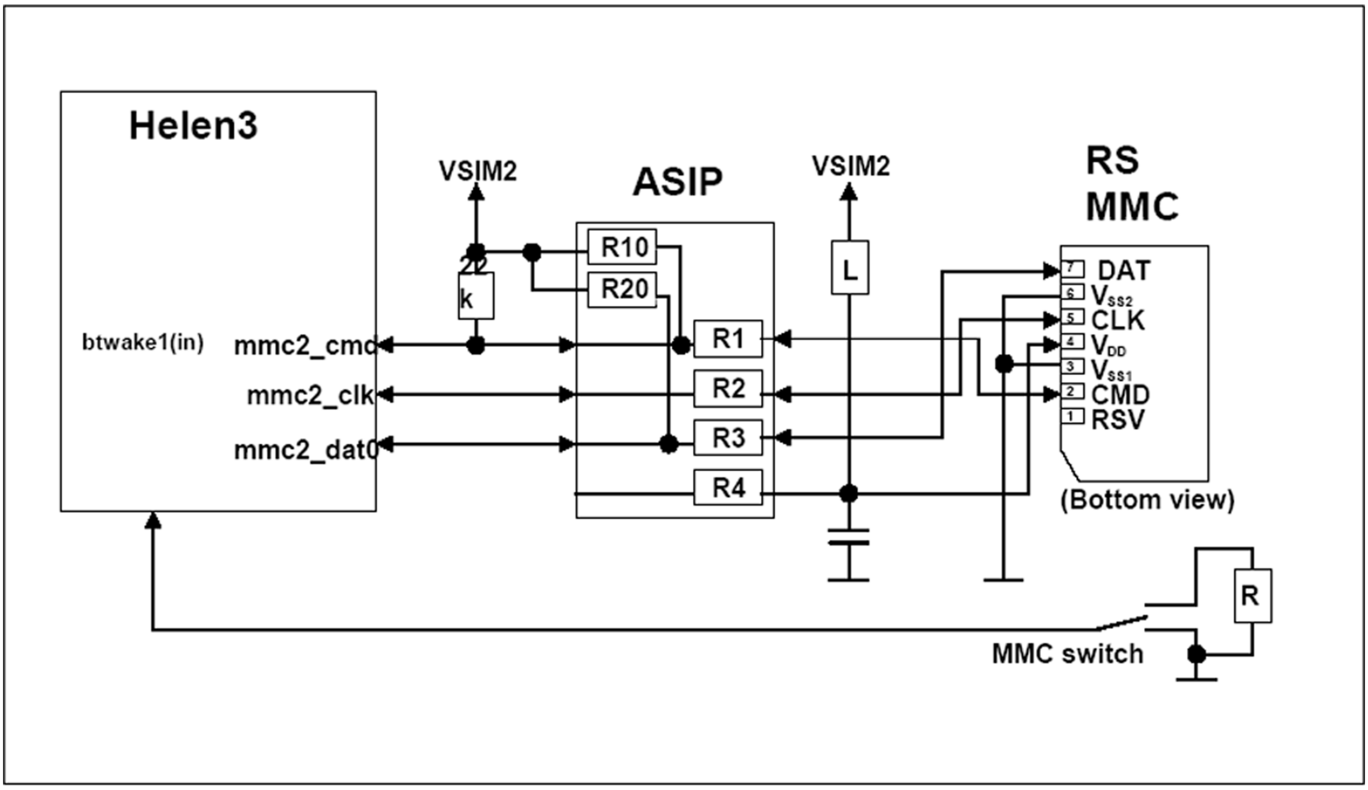


Figure 97 MMC interface

The basic multimedia card concept is based on the following communication signals CLK, CMD and DAT. With each cycle of the CLK signal one bit transfer on the DAT and CMD line is done. The maximum CLK frequency is 20MHz (specified in multimedia card specification). Maximum used CLK frequency at the time is 16MHz. CMD is a bi-directional command channel used for card initialization and data transfer commands. CMD signal has two operational modes open-drain and push-pull mode. Open-drain mode is used for card initialization and push-pull mode for fast command transfer. CMD commands are sent by the host and CMD responses are sent by the card. DAT is a bi-directional data channel, which operates at push-pull mode.

The detection of RS MMC card removal/insertion is done via RS MMC cover switch. Removing RS MMC while writing to RS MMC may corrupt data in RS MMC. RS MMC cover switch gives an interrupt to the SW while the cover is opened or closed. After RS MMC cover lid opening (RS MMC SW signal is connected to GND via cover switch) the SW power down the RS MMC card and switches off the RS MMC power supply (VSIM2). When the RS MMC cover lid is closed (RS MMC SW signal is internally connected in Helen3 to 1.8V) the card should be identified if card exists.

See also

- RS MMC interface connections (page 9–37)

Battery interface

The battery interface supports NMP Lynx battery interface for the BL-5B battery. This interface consists of three connectors: VBAT, BSI and GND. BSI line is used to recognize battery capacity by a battery internal pull down resistor.

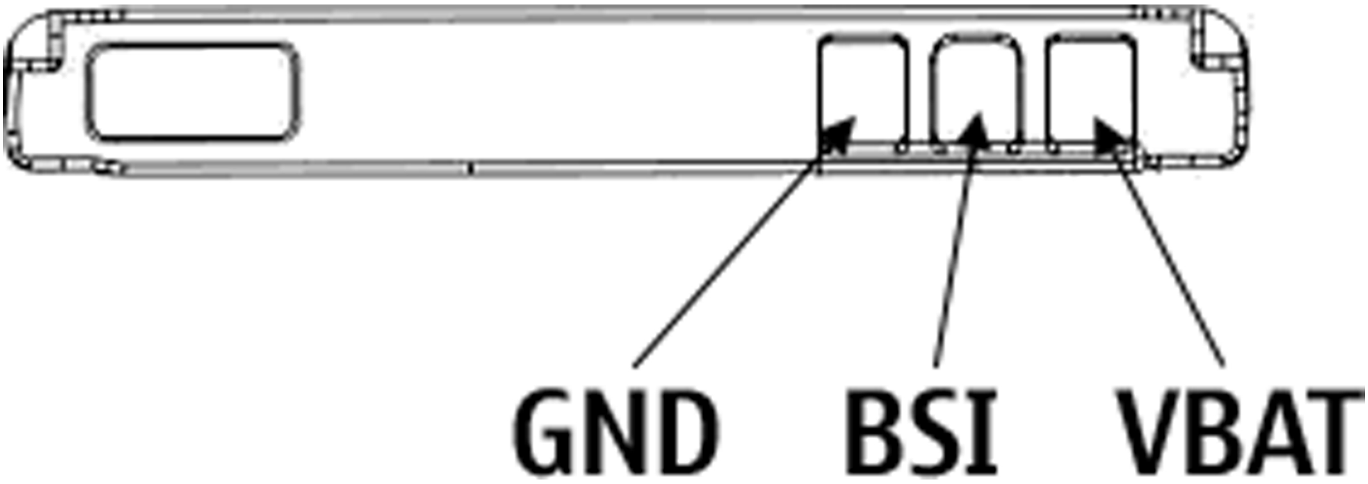


Figure 98 Battery pin order

Battery temperature is estimated by measuring separate battery temperature NTC via BTEMP line, which is located on the transceiver PWB, in a place where phone temperature is most stabile.

For service purposes the device SW can be forced into local mode by using pull down resistors connected to the BSI line.

See also

- Battery connector and interface connections & electrical characteristics (page 9–39)

Camera interface

The device uses a Unagi camera module and separate camera DSP. Unagi is a 2Mpixel camera with Auto focusing feature. AF mechanics are moved by SIDM through four PWM controlled wires from camera DSP. Sensor resolution of Unagi camera is 1600 x 1200. Unagi camera is placed to the moving camera head with Flash LED. Camera DSP is placed to engine board. The following figure shows the block diagram where two CCP bus are used to transfer image data from Unagi camera to camera DSP and from camera DSP to engine. Control interfaces for camera system are two bi-directional I2C busses, where I2C1 is an SW implemented interface. Unagi camera is connected to engine by 24 micro coaxial cables through hinge.

Two camera regulators N1470 and N1471 powers the camera system. Vcam1V5 power core parts of sensor and camera DSP. Vcam2V8 is for interfaces of camera and camera DSP. Both regulators have their own enable signals. When both of these signals are turned on High Level, the camera system enters the operation mode. When both eneble signals are turned on Low Level, the camera system enters the power off mode. Extclk signal feeds system clock for camera module and camera DSP. Flash LED strobe signal from camera DSP is used to trigger flash LED for still imaging..

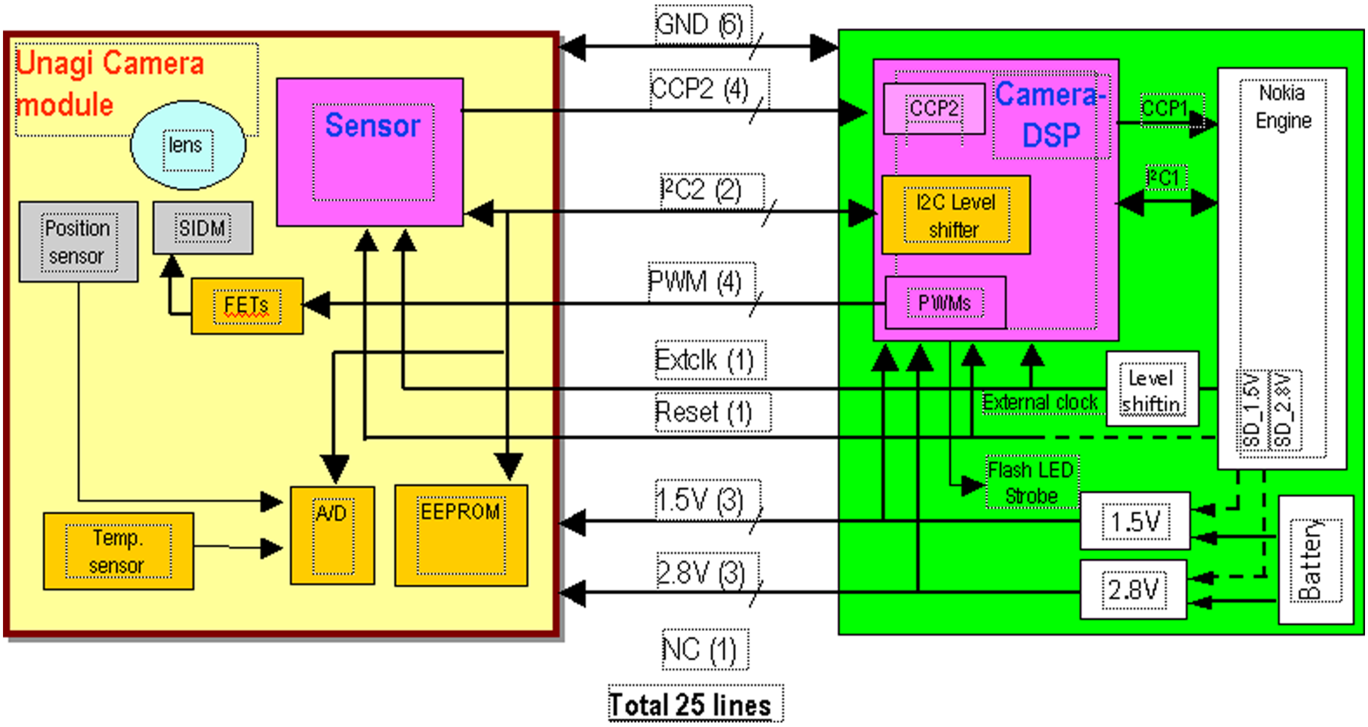

Unagi Camera module
lens
Sensor
Position sensor
SIDM
FETs
Temp. sensor
A/D
EEPROM
GND (6)
CCP2 (4)
I²C2 (2)
PWM (4)
Extclk (1)
Reset (1)
1.5V (3)
2.8V (3)
NC (1)
Total 25 lines
CCP2
Camera-DSP
I2C Level shifter
PWMs
CCP1
I²C1
Nokia Engine
External clock
Level shiftin
SD_1.5V
SD_2.8V
Flash LED Strobe
1.5V
2.8V
Battery

Figure 99 Block diagram of camera system

User interface

Display interface

Display module mechanical concept

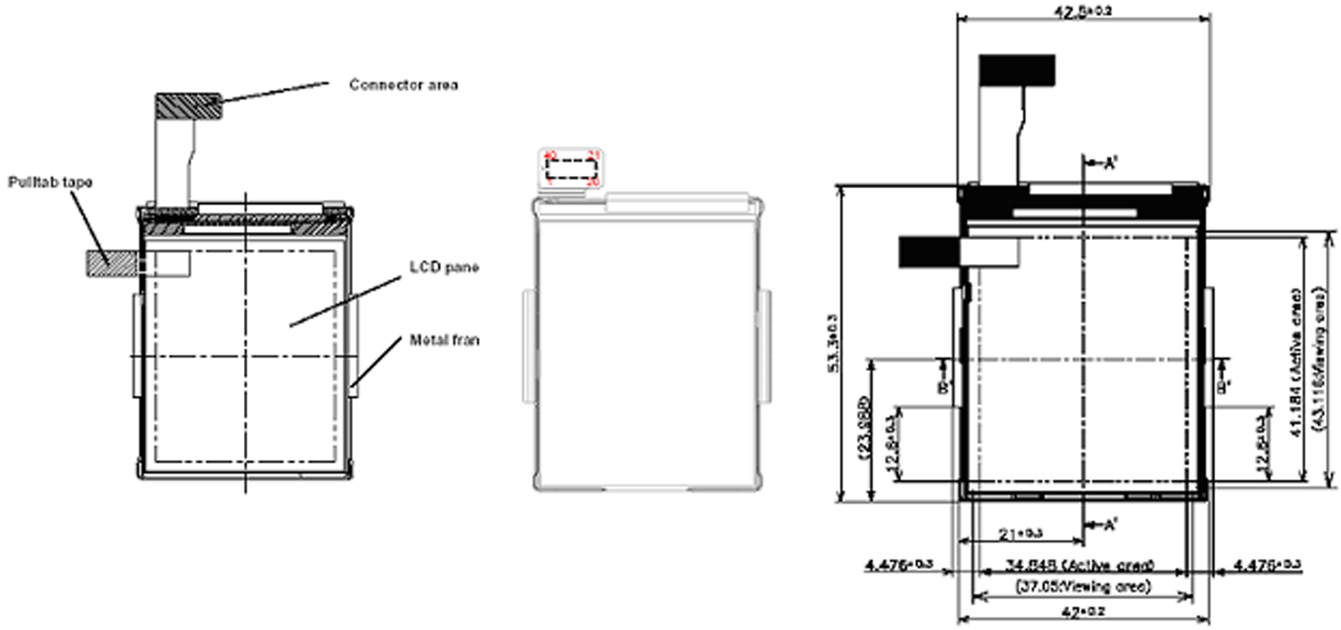

Connector area
Pulltab tape
LCD pane
Metal fran
42.5±0.2
A'
53.3±0.3
(23.988)
12.8±0.3
B'
41.184 (Active area)
(43.116Viewing area)
21±0.3
4.476±0.3
34.848 (Active area)
(37.05Viewing area)
42±0.2

Figure 100 General diagram of the main LCD display module

Main display features:

- Display is Series 60 display with format of 352 x 416 pixels.
- Maximum number of colours 262144 (18 bits)

- Backlight unit is provided, so the transflective display can be used both in reflective mode and in transmissive mode. Luminance of the display module is typically 200 nits.
- Partial display function enables power saving by pausing display process on part of the screen. Partial mode size is 50 lines x 352 pixels and only 8 colors are used.
- S60 ViSSI interface is used between the display module and the engine HW to transfer display data. LoSSI part of this interface is used to transfer display commands.
- S60 command functions (Display controlling functions and power controlling functions) are available.
- LCD display driver IC is mounted on the display glass panel. Other external components (Power IC, EEPROM and passive components) on the display module are located on the FPWB of the display module and the usage of these is depending on the supplier.
- FPWB design is done in such a way that length minimized and thickness minimized display modules can be done by using the same flex. Flex is just folded differently in these two cases.

The module includes:

- FPWB including connector, discretes and driver circuits necessary
- Display panel (glass)
- Drivers including display controller and 352 x 50 x 3 bits RAM
- Lighting system: light guide, LEDs and necessary optical sheet
- Supporting mechanics
- Metal frame (stainless steel)
- Plastic frame (ABS/ PC)

The interconnection between the LCD module and the Nokia engine is implemented with a 40-pin board-to-board connector.

The display is controlled via LoSSi and MeSSi-16 interface by Helen3. All LoSSi and MeSSi-16 signals go through micro coaxial cables to the fold part. On fold part Messi-16 signals go through the EMC filtering ASIPs to Tornado ASIC where MeSSi is converted to ViSSi-18 interface. ViSSi-18 signals go through the EMC filtering ASIPs to the display. LoSSi signals go through the EMC filtering ASIPs to the display. See the following figure:

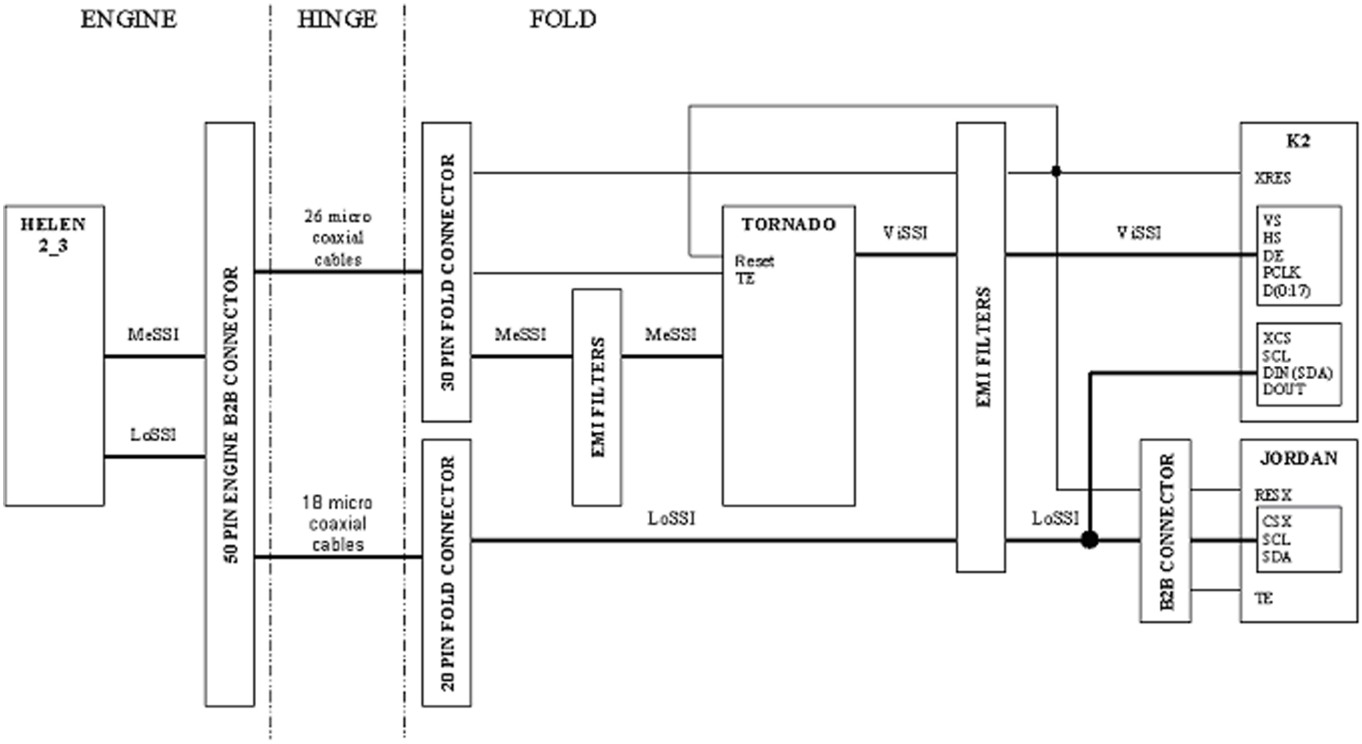

ENGINE
HINGE
FOLD
HELEN 2_3
MeSSI
LoSSI
50 PIN ENGINE B2B CONNECTOR
26 micro coaxial cables
18 micro coaxial cables
30 PIN FOLD CONNECTOR
20 PIN FOLD CONNECTOR
MeSSI
EMI FILTERS
MeSSI
TORNADO
Reset
TE
ViSSI
EMI FILTERS
ViSSI
LoSSI
LoSSI
K2
XRES
VS
HS
DE
PCLK
D(0:17)
XCS
SCL
DIN (SDA)
DOUT
B2B CONNECTOR
JORDAN
RESX
CSX
SCL
SDA
TE

Figure 101 LoSSi signals

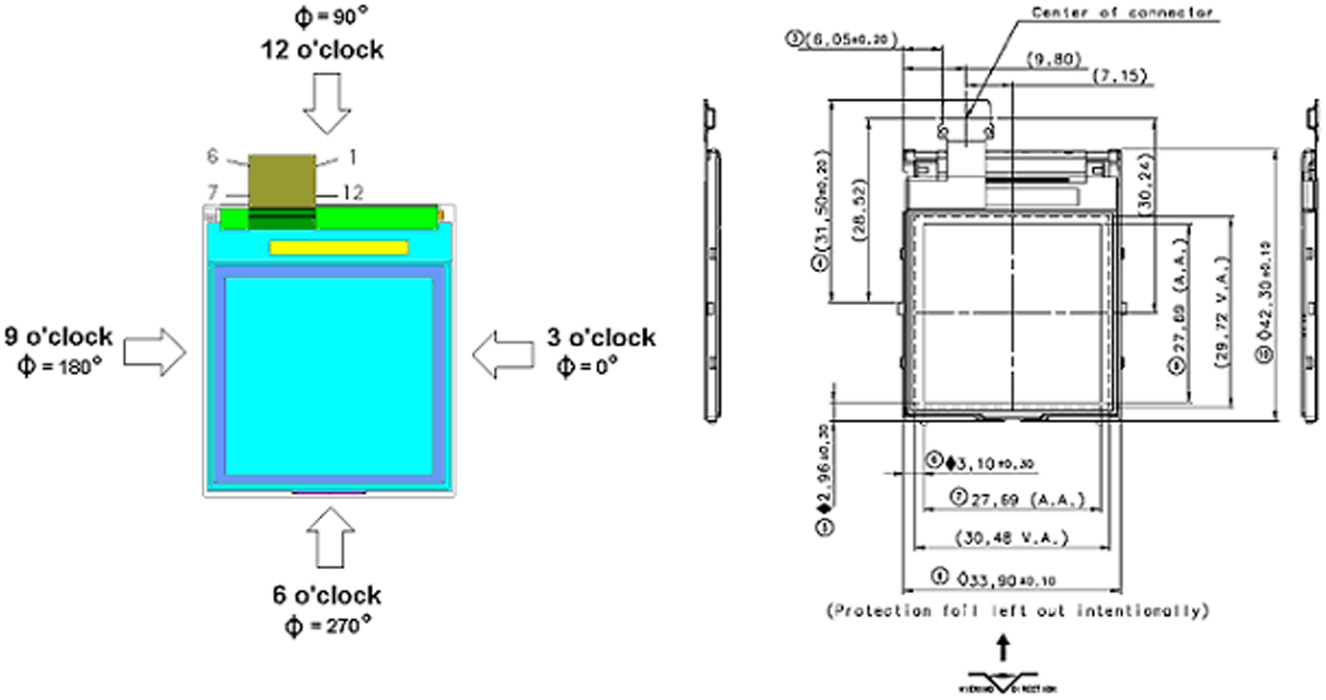

Φ = 90°
12 o'clock
6
1
7
12
9 o'clock
Φ = 180°
3 o'clock
Φ = 0°
6 o'clock
Φ = 270°
Center of connector
③(6,05±0,20)
(9,80)
(7,15)
④(31,50±0,20)
(28,52)
(30,24)
⑨27,69 (A.A.)
(29,72 V.A.)
⑩Ô42,30±0,15
⑤◆2,96±0,30
⑥◆3,10±0,30
⑦27,69 (A.A.)
(30,48 V.A.)
① Ô33,90±0,10
(Protection foil left out intentionally)

Figure 102 General diagram of the sub-display module

Sub-display features:

- Display is Series 40 display with format of 128 x 128 pixels.
- Maximum number of colors is 65 536 (16 bits).
- Backlight unit is provided, so the transflective display can be used both in reflective mode and in transmissive mode.

- 9-bit serial interface is used between the display module and the engine HW to transfer display data. LoSSI interface is used to transfer display commands.
- S40 command functions (Display controlling functions and power controlling functions) are available.
- LCD display driver IC is mounted on the display glass panel. Other external components (Power IC, EEPROM and passive components) on the display module are located on the FPWB of the display module

The module includes:

- FPC foil including connector and required passive/active components.
- Display panel (glass) with COG driver including display controller and 132 x132 x16 bit RAM
- Illumination system: backlight module, which includes lightguide with white casing, optical sheets and 3 white LEDs.
- Plastic holder frame

The interconnection between the LCD module and display flex is implemented with 12-pin board-to-board connector.

The display module is equipped with bi-directional 9-bit serial interface

Jordan display is controlled via LoSSi interface by Helen3. All LoSSi signals go through the EMC filtering ASIPs to Jordan display.

Display modules do not require any tunings in service.

Keyboard

The device keyboard is connected to the main PWB with a board-to-board connector.

The keymatrix has seven rows and five columns. The SW application keys on the Fold PWB and the capture key are connected to the same keymatrix. Joystick is connected to GPIOs of OMAP.

Table 16 Keymatrix

Row	Col3	Col2	Col1	Col0	Col4	Col5
Row0	Right	Left	Right soft key	Left soft key	rsoft_fold	lsoft_fold
Row1	Down	Up	Send	Select	Captkeyhalf	Captkeyfull
Row2	8	3	2	7		
Row3	6	1		5		
Row4	#		*	9		
Row5	4		Reserved for Charlie use	End		
Row6	Apps	Clear	Edit	0		
Row7						

Joystick function	GPIO
Right	GPIO49
Down	GPIO50
Left	GPIO51

Joystick function	GPIO
Up	GPIO52
Select	GPIO53

Signal name	X4401 Pin #	X4400 Pin #
Col0	10	
Col1	21	
Col2	18	
Col3	13	
Col4	22	40
Col5	23	41
Row0	9	39
Row1	7	
Row2	28	
Row3	27	
Row4	12	
Row5	11	
Row6	8	
Joystick_Right	14	
Joystick_Down	20	
Joystick_Left	19	
Joystick_Up	15	
Joystick_Push	17	
VLEDOUT2	1	
SETCURR2	2	

Engine flex connector pin configuration

Display and keyboard backlight

The device has one Led Driver (SMPS) that is used to drive both displays and keyboard LEDs. LEDs on display modules and on keyboard are connected so that there are 4 LEDs on K2 (in series), 3 LEDs on Jordan (in series) and 4 LEDs on keyboard (in series). These circuits are connected parallel to Led Driver output.

Current adjustment of the driver is done from the display LED branch, and keyboard current also depends on the display brightness.

In a typical use case, keyboard LEDs are turned ON only in dark ambient lighting conditions.

K2 and Jordan backlights can´t be turned on at the same time.

Control signals for LED driver are:

	From	To	Voltage	Function
GenOut1	TAHVO	R2302 (10k)	0V / 1.8V	Maximum current control (0V ->max curr.)
GenOut2	TAHVO	R2301 (4k7)	0V / 1.8V	
PWM	TAHVO	J2309, N2301	PWM 0%-100%, 1.8V	Current PWM control (16 steps)
GenOut3	TAHVO	V2300	0V / 1.8V	Keyboard LEDs ON (1.8V) /OFF (0V)
GenIO46	Rap3G	-->	BLS	Display backlight select (1 = K2 backlights on, 0 = Jordan backlights on)

ALS interface

Ambient Light Sensor (ALS) is located in the fold part of the phone. It consists of a lightguide (part of front cover), components of 1LB PWB: phototransistor (V1000)+ resistor (R1006), NTC + resistors (R1004, R1005, R1007) and RETU EM ASIC (N2200)on 1HU PWB (Gromit engine). Information of ambient lighting is used to control the backlights of the phone:

- Keypad lighting is switched on only when environment is dark / dim
- Display backlights are dimmed, when environment is dark / dim

Ambient light sensor itself is a photo transistor which is temperature-compensated by an external NTC resistor. Retu with its ADC reads the light sensor (LS) and temperature (LST) results.

ALS calibration is not possible in the service points. It is replaced by using selected phototransistors as spare parts.

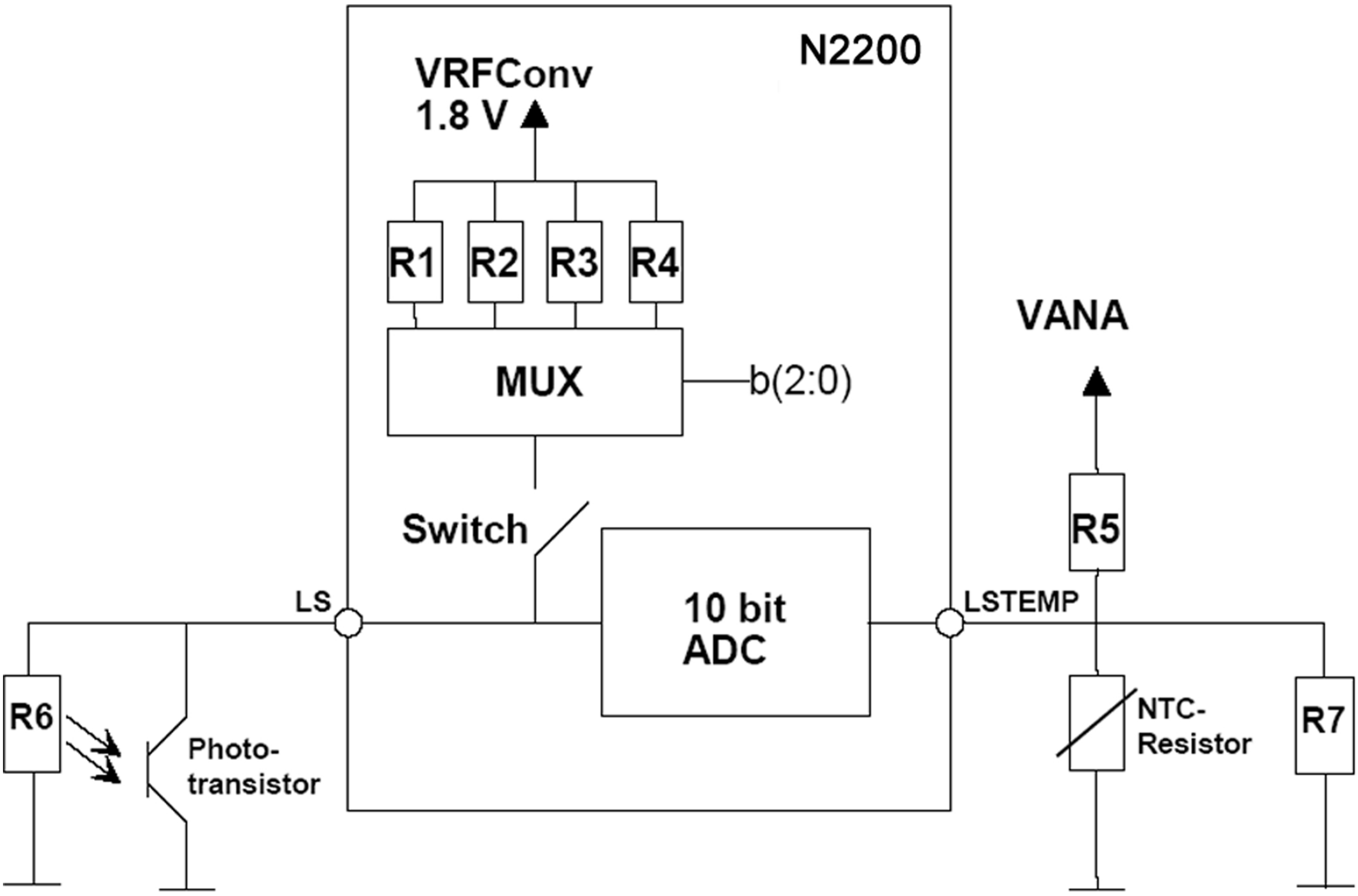

N2200
VRFConv
1.8 V
R1
R2
R3
R4
MUX
b(2:0)
Switch
10 bit
ADC
LS
LSTEMP
VANA
R5
R6
Photo-
transistor
NTC-
Resistor
R7

Figure 103 ALS HW implementation

Table 17 ALS resistor values

Symbol	R1	R2	R3	R4	R5	R6	R7	NTC-res
Value	5 kOhm	15 kOhm	30 kOhm	50 kOhm	470 kOhm	100 kohm	470 kohm	47 kOhm

ASICs

RAP ASIC

RAP ASIC is a 3G Radio Application Processor. RAM memory is integrated into RAP.

In general RAP consists of three separate parts:

- Processor subsystem (PSS) that includes the main processor and related functions
- MCU peripherals that are mainly controlled by MCU
- DSP peripherals that are mainly controlled by DSP

RAP core voltage (1.4 V) is generated from the EM ASIC (N2300) VCORE and I/O voltage (1.8 V) is from the EM ASIC (N2200) VIO. The core voltage in sleep mode is lowered to 1.05 V.

EM ASIC N2200

EM ASIC N2200 includes the following functional blocks:

- Start up logic and reset control
- Charger detection
- Battery voltage monitoring

- 32.768 kHz clock with external crystal
- Real time clock with external backup battery
- SIM card interface
- Stereo audio codecs and amplifiers
- A/D converter
- Regulators
- Vibra interface
- Digital interface (CBUS)

EM ASIC N2300

EM ASIC N2300 includes the following functional blocks:

- Core supply generation
- Charge control circuitry
- Level shifter and regulator for USB/FBUS
- Current gauge for battery current measuring
- External LED driver control interface
- Digital interface (CBUS)

Device memories

RAP memories NOR flash and SDRAM

The modem memory consists of 64 Mbit SDRAM and 64 Mbit NOR flash memories.

SDRAM is a dynamic memory for ISA (Intelligent Software Architecture) SW.

NOR is used for ISA SW code and PM data and CDSP (Cellular Digital Signal Processor) SW code.

SDRAM core voltage (1.8 V) is generated from N2200 VDRAM and I/O voltage (1.8 V) is from VIO. NOR flash uses VIO for both core and I/O voltages.

Combo memory

The application memory of the device consists of NAND/DDR combo memory. Stacked DDR/NAND application memory has 512 Mbit of DDR memory and 512 Mbit of flash memory. DDR DRAM memory is stacked above the NAND flash.

OMAP includes a 16-bit dedicated memory interface called external memory interface fast (EMIFF). This is used to support interface for DDR memory. OMAP 1710 provides also NAND flash controller located on the shared peripheral bus, providing support for 8-bit NAND flash. The interface requires an 8-bit address bus multiplexed with 8-bit data bus and several control signals.

Core voltage for DDR is 1.8V, which is generated by discrete LDO (LP3990ITLX). 1.8V (VIO) is for DDR I/O voltage. Both NAND core and I/O voltages are 1.8V generated by VIO.

■ Audio concept

Audio HW architecture

The functional core of the audio hardware is built around two ASICs: RAP 3G CMT engine ASIC and the mixed-signal ASIC Retu.

Retu provides an interface for the transducers and the accessory connector. Because audio amplifiers are also integrated into Retu, the only discrete electronics components needed for audio paths are audio filtering components and EMC/ESD components.

There are three audio transducers:

- 7x 11mm dynamic earpiece
- 16mm dynamic speaker
- electret microphone module

All galvanic audio accessories are connected to the Pop-Port™ accessory connector.

A Bluetooth module that is connected to RAP3G supports Bluetooth audio functionality.

There is a separate application ASIC, Helen 3 (OMAP 1710) for Symbian applications..

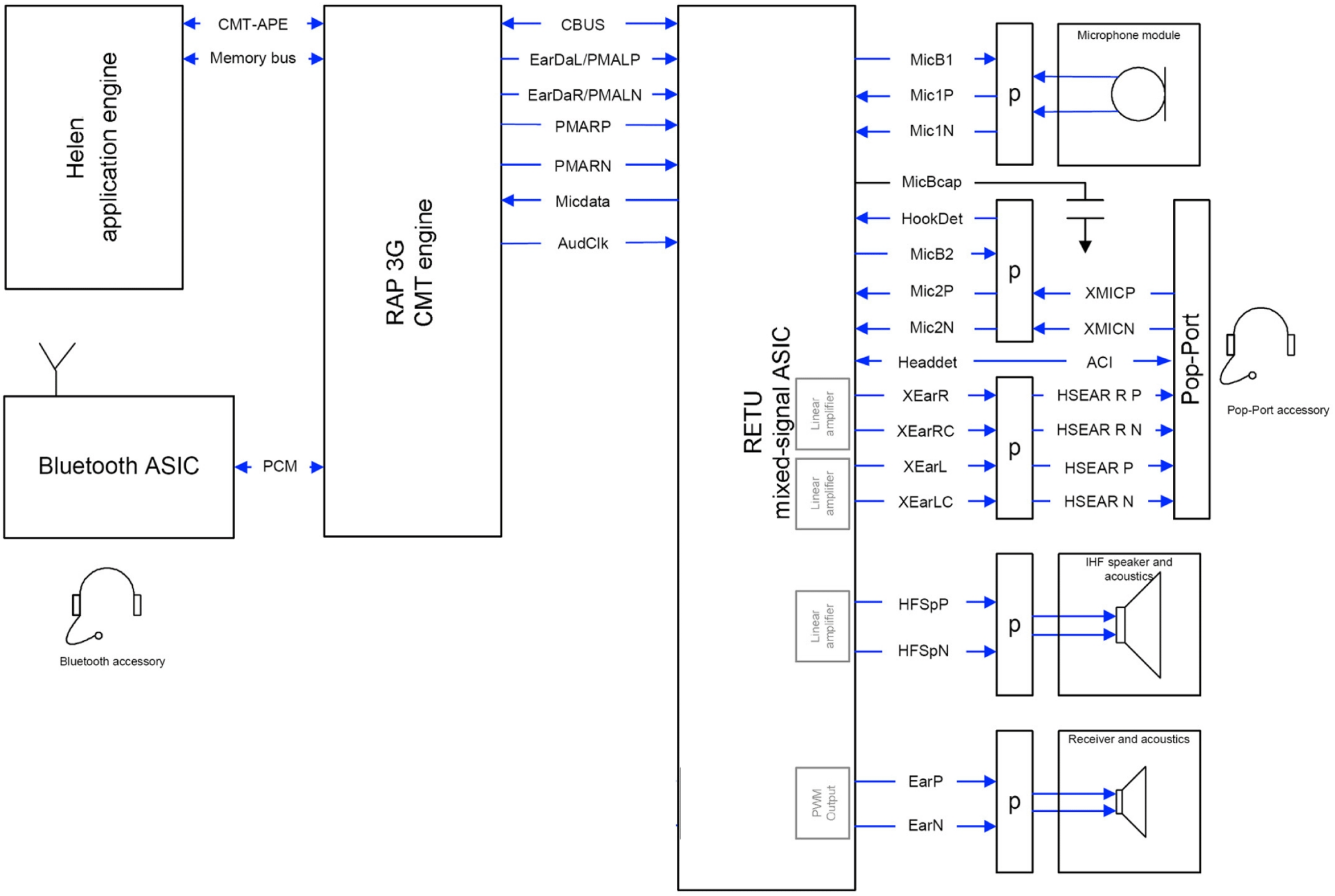

Helen
application engine
CMT-APE
Memory bus
RAP 3G
CMT engine
CBUS
EarDaL/PMALP
EarDaR/PMALN
PMARP
PMARN
Micdata
AudClk
Bluetooth ASIC
PCM
Bluetooth accessory
RETU
mixed-signal ASIC
Linear amplifier
Linear amplifier
Linear amplifier
PWM Output
MicB1
Mic1P
Mic1N
MicBcap
HookDet
MicB2
Mic2P
Mic2N
Headdet
XEarR
XEarRC
XEarL
XEarLC
HFSpP
HFSpN
EarP
EarN
p
p
p
p
p
Microphone module
XMICP
XMICN
ACI
HSEAR R P
HSEAR R N
HSEAR P
HSEAR N
Pop-Port
Pop-Port accessory
IHF speaker and acoustics
Receiver and acoustics

Figure 104 Audio block diagram

Internal microphone

Internal microphone is used for HandPortable (HP) and Internal HandsFree (IHF) call modes.

An analogue electret microphone is connected to Retu ASIC's Mic1P and Mic1N inputs via asymmetric electrical connection.

The microphone is biased by Retu ASIC MicB1 bias voltage output.

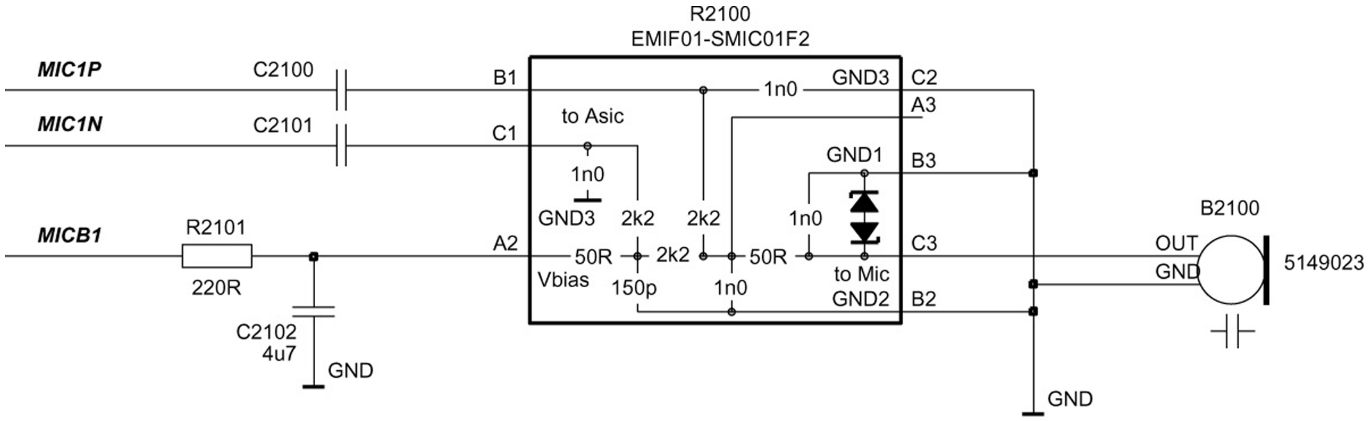

MIC1P
C2100
MIC1N
C2101
MICB1
R2101
220R
C2102
4u7
GND
R2100
EMIF01-SMIC01F2
B1
C1
A2
to Asic
1n0
GND3
2k2
2k2
1n0
GND3
GND1
1n0
50R
2k2
50R
Vbias
150p
1n0
to Mic
GND2
C2
A3
B3
C3
B2
GND
B2100
OUT
GND
5149023

Figure 105 Internal microphone circuitry

External microphone

Galvanic accessories are connected to the system connector (Pop-Port^{TM}).

Accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories.

External microphone circuitry is biased by Retu ASIC MicB2 bias voltage output. The circuitry provides a symmetrical connection for the microphone from the Pop-Port^{TM}connections, XMICN and XMICP, to Retu ASIC inputs, Mic2P and Mic2N.

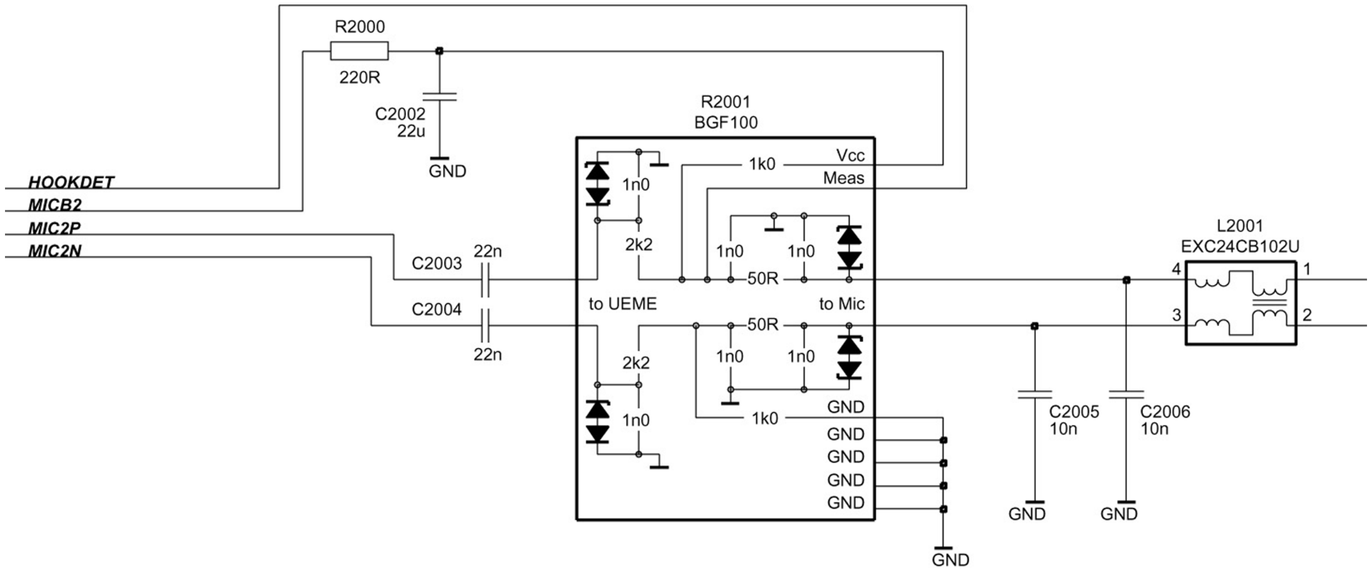

R2000
220R
C2002
22u
GND
HOOKDET
MICB2
MIC2P
MIC2N
C2003
22n
C2004
22n
R2001
BGF100
1n0
2k2
to UEME
2k2
1n0
1k0
Vcc
Meas
1n0
1n0
50R
to Mic
50R
1n0
1n0
1k0
GND
GND
GND
GND
GND
GND
L2001
EXC24CB102U
4
1
3
2
C2005
10n
C2006
10n
GND
GND

Figure 106 External microphone circuitry (Pop-Port connects to the right side)

Internal earpiece

Internal earpiece is used for the HandPortable (HP) call mode. A dynamic 7 x 11mm earpiece capsule is connected to Retu ASIC's differential output EarP and EarN.

Earpiece capsule is assembled to fold unit (inside of display frame), but some filter components are also in engine PWB.

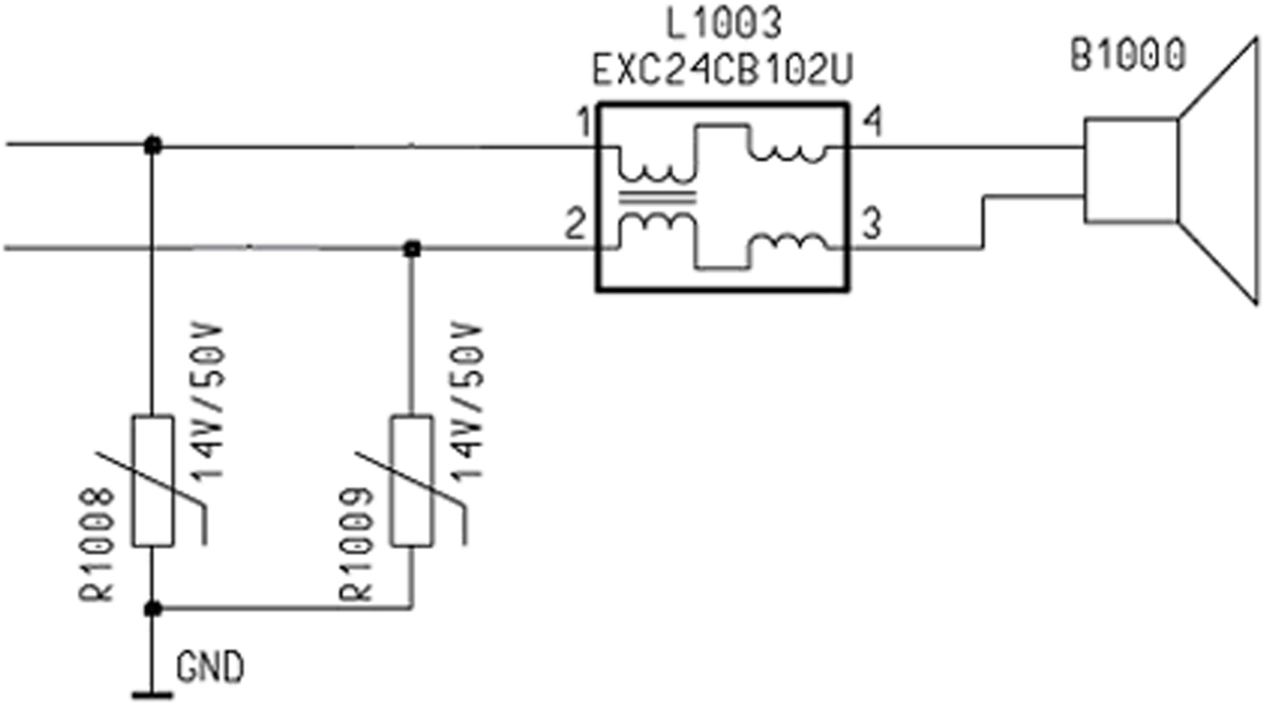

L1003
EXC24CB102U
B1000
1
2
3
4
R1008
14V/50V
R1009
14V/50V
GND

Figure 107 Internal earpiece circuitry

Internal speaker

Internal speaker is used for Internal HandsFree (IHF) call mode.

A dynamic 16mm speaker is connected to Retu ASIC's outputs HFSpP and HFSpN.

IHF amplifier integrated in Retu is a Digital Pulse Modulated Amplifier (DPMA).

Speaker is assembled to camera unit, but some filter components are also in engine PWB.

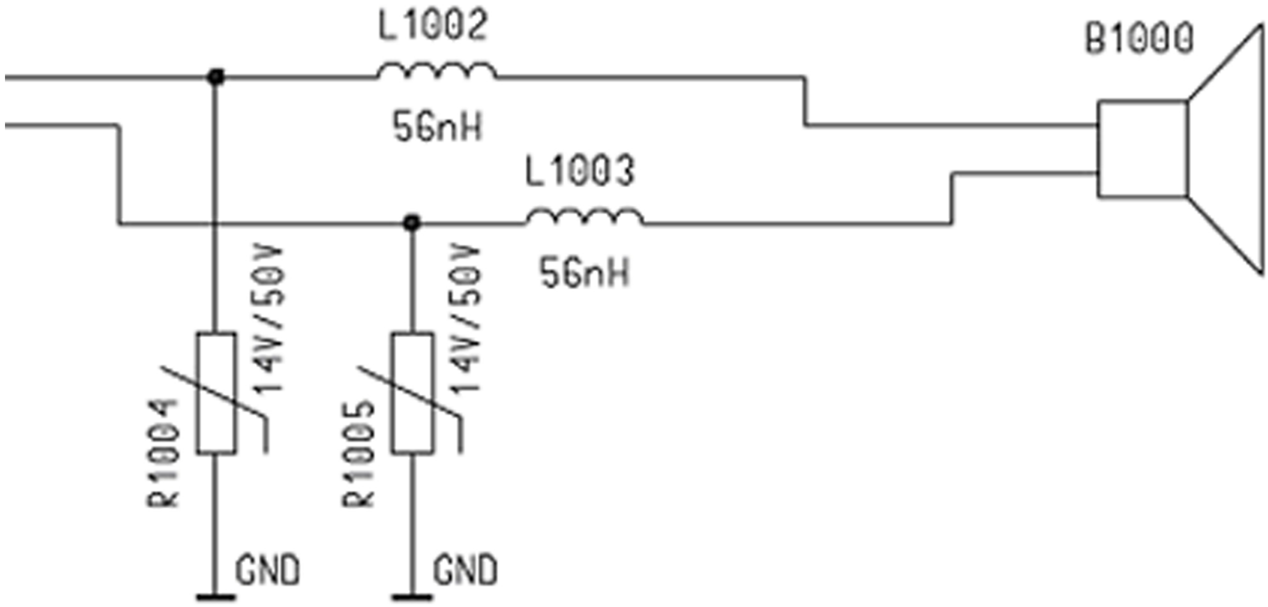


Figure 108 Internal speaker circuitry

External earpiece

All galvanic accessories are connected to the system connector.

The accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories.

N2200 provides two output channels in either single-ended or differential format. N2200 outputs XearL and XearLC form the left channel audio output, and XearR and XearRC the right channel audio output. XearLC and XearRC are the ground pins if the output works in a single-ended operation.

On the system connector side, HSEAR P and HSEAR N form the left channel output, and HSEAR R P and HSEAR R N the right channel output. Respectively, HSEAR N and HSEAR R N are the ground pins if the output works in a single-ended operation.

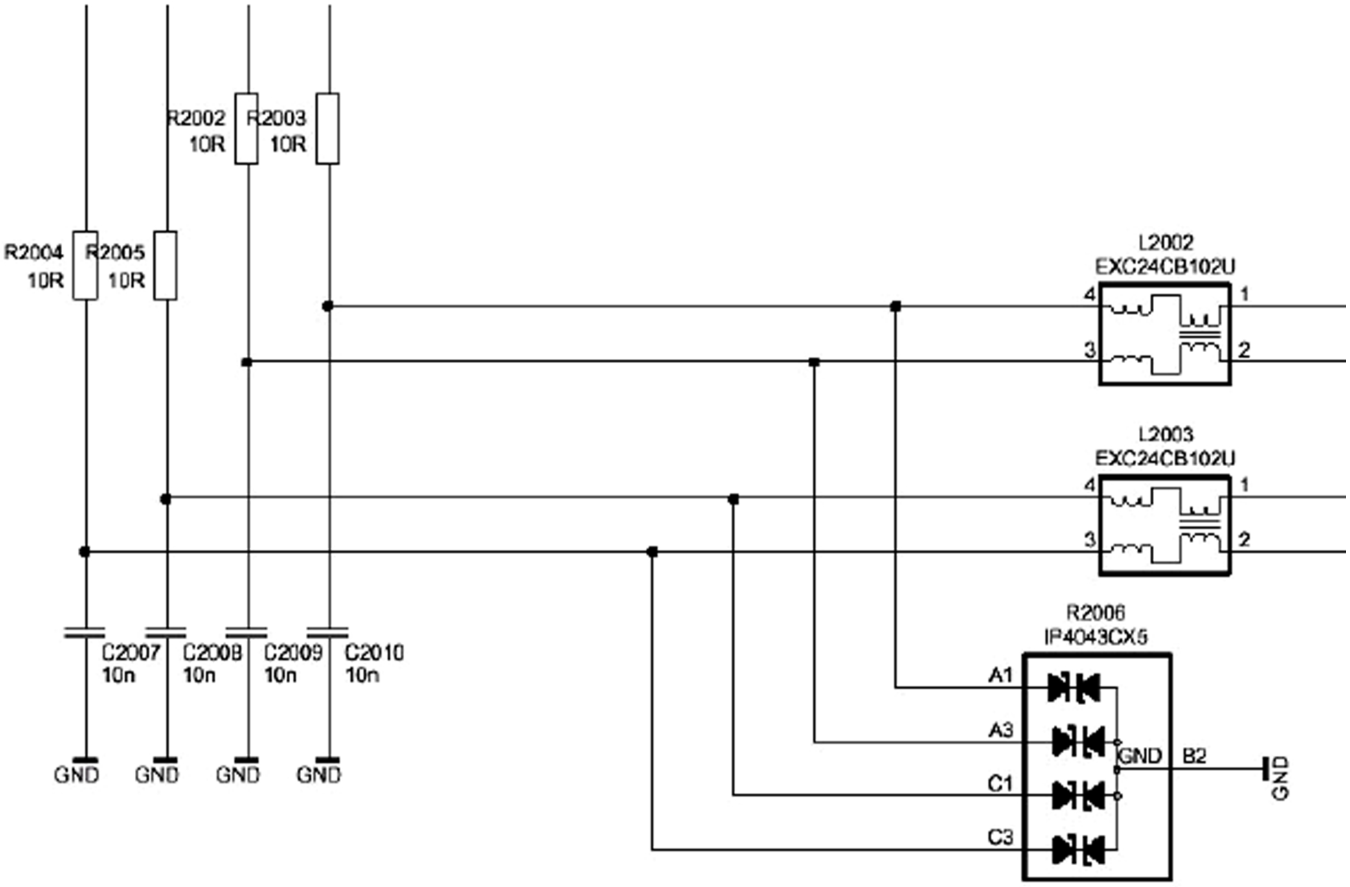

R2002
10R
R2003
10R
R2004
10R
R2005
10R
L2002
EXC24CB102U
4
1
3
2
L2003
EXC24CB102U
4
1
3
2
R2006
IP4043CX5
A1
A3
C1
C3
GND
B2
GND
C2007
10n
C2008
10n
C2009
10n
C2010
10n
GND
GND
GND
GND

Figure 109 External earpiece circuitry (system connector connected on the right)

Pop-port^{TM} connector

Pop-Port^{TM} connector provides a fully differential 4–wire stereo line-level output connection and fully differential 2-wire mono line-level or microphone level input connection.

The handsfree driver in Retu is meant for the headset.

The output is driven in a fully differential mode. In the fully differential mode, the handsfree pin is the negative output and the HFCM pin is the positive output. The gain of the handsfree driver in the differential mode is 6 dB.

The earpiece and headset signals are multiplexed so that the outputs cannot be used simultaneously.

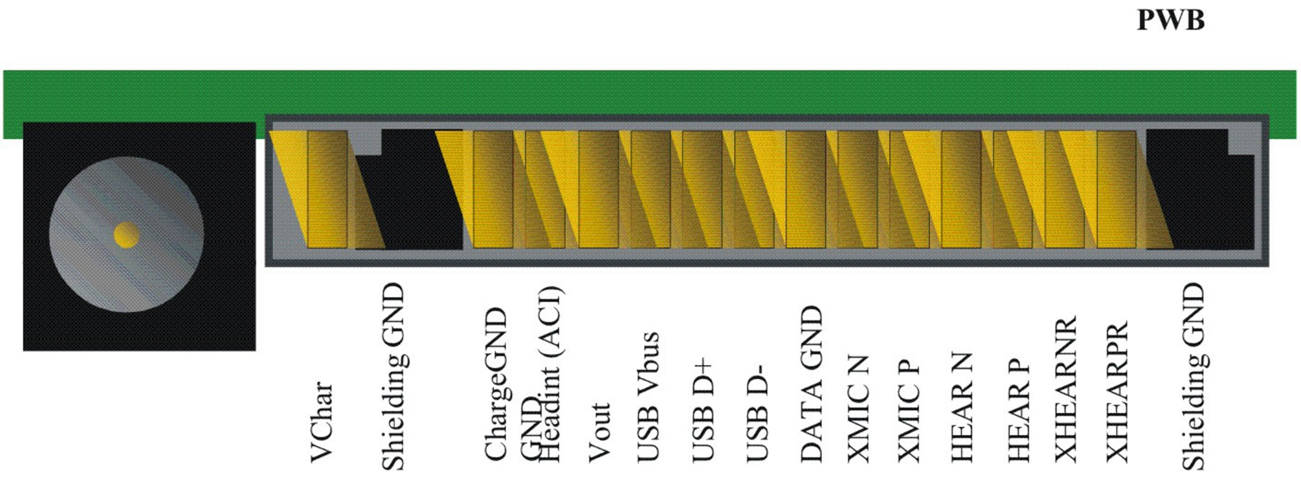

PWB
VChar
Shielding GND
ChargeGND
GND
Headint (ACI)
Vout
USB Vbus
USB D+
USB D-
DATA GND
XMIC N
XMIC P
HEAR N
HEAR P
XHEARNR
XHEARPR
Shielding GND

Figure 110 External audio connector

Table 18 Audio connector pin assignments

Pin #/ Signal name	Signal description	Spectral range	Voltage/ Current levels	Max or nominal serial impedance	Notes
1/ Charge	V Charge	DC	0-9V/ 0.85A		
2/ GND	Charge GND	-	0.85A	100mΩ (PWB+ conn.)	
3/ ACI	ACI	1kbits/s	Digital 0 / 2.5-2.78V	47Ω	Insertion & removal detection
4/ Vout	DC out	DC	2.78V 70 mA 2.5V 90mA	100mΩ (PWB+ conn.)	200mW
9 / XMIC N	Audio in	300-8k	1Vpp & 2.5-2.78VDC		
10 / XMIC P	Audio in	300-8k	1Vpp & 2.5-2.78VDC		
11 / HEAR N	Audio out	20-20k	1Vpp	10Ω	
12 / HEAR P	Audio out	20-20k	1Vpp	10Ω	
13 / HEAR R N	Audio out	20-20k	1Vpp	10Ω	Not conn. in mono
14 / HEAR R P	Audio out	20-20k	1Vpp	10Ω	Not conn. in mono

Baseband technical specifications

External interfaces

Name of Connection	Connector reference
USB	X2001

Name of Connection	Connector reference
Charger	X2000
Headset	X2001
SIM	X2700
RS MMC	X5200
Battery connector	X2070

ACI interface electrical characteristics

Description	Parameter	Min	Typ	Max	Unit	Notes
Accessory detection						
Headset detection threshold		1.75	1.9	2.05	V	N2200 specific
Headset detection hysteresis			25		mV	
Headset detection pull ups		1	2	4	uA	
After Mbus is switched to HeadDet						
High-level input voltage (VDDS = 1.8V)	V_{IH}	0.7 x V_{DDS}		V_{DDS}	V	RAP specific
Low-level input voltage	V_{IL}	0		0.3 x V_{DDS}	V	
High-level output voltage	V_{OH}	0.8 x V_{DDS}		V_{DDS}	V	
Low-level output voltage	V_{OL}	0		0.22 x VDDS	V	
Rise/fall time	tR/tF			25	ns	

VOUT electrical characteristics

Description	Parameter	Min	Max	Unit	Notes
Vout regulator for external accessories	VOUT	2.43	2.57	V	Max load 90mA

USB IF electrical characteristics

Description	Parameter	Min	Max	Unit	Notes
Absolute maximum voltage on D+ and D-	$V_{D+/D-}$	-1	4.6	V	USB specification revision 2.0
Supply voltage	VBUS	4.4	5.25	V	
Supply current:					
Functioning	I_{VBUS}		100	mA	
Suspended	I_{VBUS}		500	uA	
Unconfigured	I_{VBUS}		100	mA	
High-level input voltage:				V	
High (driven)	V_{IH}	2			
High (floating)	V_{IHZ}	2.7	3.6		
Low-level input voltage	V_{IL}		0.8	V	
Differential input sensitivity	V_{DI}	0.2		V	|(D+) - (D-)|
Differential input voltage range	V_{CM}	0.8	2.5	V	Included VDI range
Low-level output voltage	V_{OL}	0	0.3	V	
High-level output voltage (driven)	V_{OH}	2.8	3.6	V	
Output signal crossover voltage	V_{CRS}	1.3	2	V	

FBUS interface electrical characteristics

Description	Parameter	Min	Max	Unit
High-level input voltage	V_{IH}	$0.7 \times V_{DDSHV2}$	V_{DDSHV2}	V
Low-level Input voltage	V_{IL}	0	$0.3 \times V_{DDSHV2}$	V
High-level output voltage	V_{OH}	$0.8 \times V_{DDSHV2}$	V_{DDSHV2}	V

Description	Parameter	Min	Max	Unit
Low-level output voltage	V_{OL}	0	0.22 x V_{DDSHV2}	V
Rise/fall time	tR/tF	0	25	ns
(VDDSHV2 = 1.8V)				

Headset hook detection interface (XMICN) electrical characteristics

Description	Min	Typ	Max	Unit	Notes
Hook detection threshold 1	1.25	1.35	1.45	V	Two fixed thresholds inside N2200. Selectable by SW
Hook detection threshold 2	0.5	0.6	0.7	V	
Hook detection hysteresis		25		mV	
Hook detection pull ups	1	2	4	uA	

Audio signal electrical characteristics

Description	Parameter	Typ	Unit	Notes
XMIC N	Audio in	1	V_{pp}	DC Offset 2.5-2.78V
XMIC P	Audio in	1	V_{pp}	DC Offset 2.5-2.78V
HSEAR N	Audio out	1	V_{pp}	10Ω nominal serial impedance
HSEAR P	Audio out	1	V_{pp}	10Ω nominal serial impedance
HSEAR R N	Audio out	1	V_{pp}	10Ω nominal serial impedance
				Not connected in mono
HSEAR R P	Audio out	1	V_{pp}	10Ω nominal serial impedance
				Not connected in mono

SIM IF connections

Pin	Signal	I/O	Engine connection		Notes
C1	SIMCLK	Out	Retu	SIM1ClkC	Clock signal to SIM card

Pin	Signal	I/O	Engine connection		Notes
C2	SIMRST	Out	Retu	SIM1Rst	Reset signal to SIM card
C3	VSIM	Out	Retu	VSIM1	Supply voltage to SIM card, 1.8V or 3.0V.
C5	SIMDATA	In/Out	Retu	SIM1DaC	Data input / output
C7	GND	-	GND		Ground

RS MMC interface connections

Pin	Signal	I/O	Engine connection		Notes
1	RSV		NC	NC	Reserved for future use
2	CMD	<->	D4800	MMC2_CMD	Command/ Response
3	Vss1		GND		Ground
4	V_{DD}	<-	N2200	VSIM2	VSIM2, supply voltage 1.8 (Max 70mA)
5	CLK	<-	D4800	MMC2_CLK	External clock for the MMC card, Max 20 MHz
6	Vss2		GND		Ground
7	DAT	<->	D4800	MMC2_DAT0	Bi-directional data bus
-	MMCDET	->	D4800	btwake1(in) [P10]	MMC card detect

Charger connector and charging interface connections & electrical characteristics

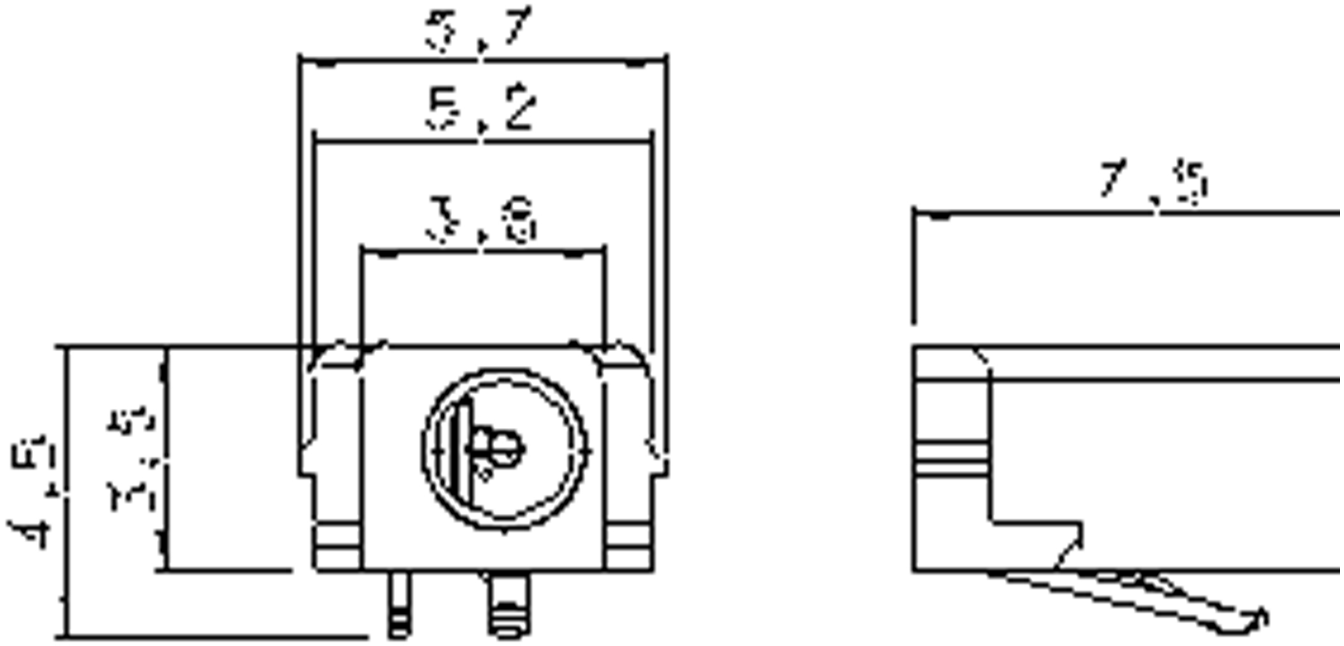


Figure 111 Charger connector

Table 19 Charging interface connections

Pin	Signal	I/O	Engine connection		Notes
1	Vchar	In	Tahvo	VCharIn1, 2	Charging voltage / charger detection, Center pin
2	Charge GND		Ground		Charger ground

Table 20 Charging IF electrical characteristics

Description	Parameter	Min	Max	Unit	Notes
Vchar	V Charge	0	9	V	Center pin
Vchar	I Charge		0.85	A	Center pin
Charge GND			0.85	A	
Threshold for charging, rising (TAHVO)	V_{MSTR+}	2.1		V	Typical value

Description	Parameter	Min	Max	Unit	Notes
Threshold for charging, falling (TAHVO)	V_{MSTR-}	1.9		V	Typical value

Battery connector and interface connections & electrical characteristics

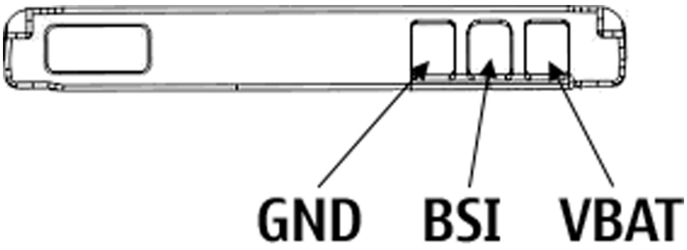


Figure 112 Battery connector

Table 21 Battery interface connections

Pin	Signal	I/O	Engine connection		Notes
1	VBAT	->	EM ASIC N2200	VBAT	Battery voltage
2	BSI	->	EM ASIC N2200	BSI	Battery size indication (fixed resistor inside the battery pack)
3	GND		GND		Ground

Table 22 Battery IF electrical characteristics

Description	Parameter	Max	Unit
Operation voltage	V_{IN}	4.23	VDC
Current rating	I_{IN}	0.9	A

Internal interfaces

Name of Connection	Connector reference	Notes
Fold unit connector	X4400	
Keyboard connector	X4401	
Camera	X1470	Unagi

Keyboard connector

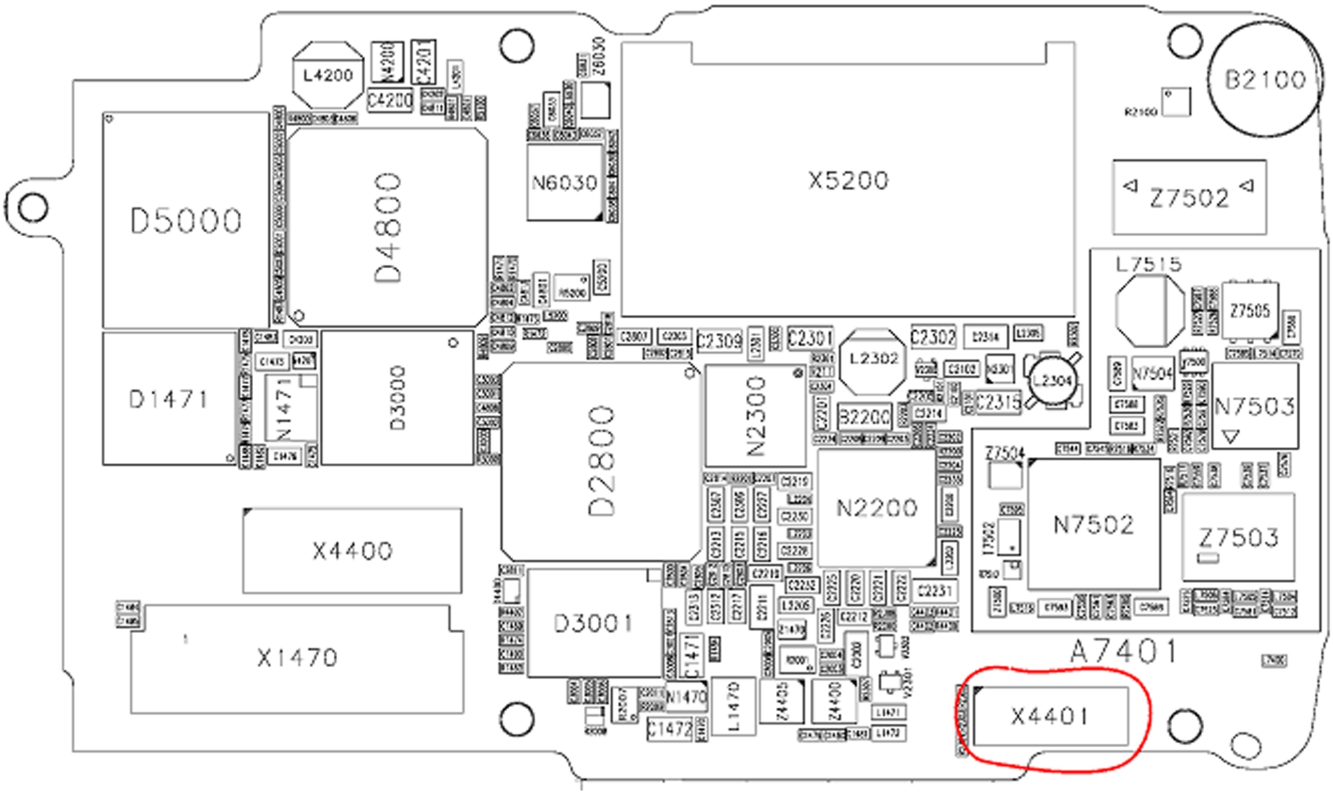

L4200
C4200
D5000
D4800
N6030
X5200
B2100
Z7502
L7515
Z7505
N7503
D1471
N1471
D3000
D2800
N2300
L2302
C2301
C2302
C2309
B2200
C2315
L2304
N2200
N7502
Z7504
Z7503
X4400
X1470
D3001
A7401
X4401
N1470
C1472
C1471
L1470

Figure 113 Keyboard connector

Table 23 User interface connections

Pin	Signal	I/O	Engine connection		Notes
1	GND		GND		
2	LED+	<-	N2301	VLEDOUT2	Discrete Backlight SMPS (controlled by Tahvo)
3	Col2	->	Helen3	Kbc_2	
4	LED-	->	R2305 + V2300	SETCURR2	Serial resistor + Transistor switch (controlled by Tahvo)
5	Col1	->	Helen3	Kbc_1	Voice switch connection
6	GND		GND		
7	Row3	->	Helen3	Kbr_3	
8	Row2	->	Helen3	Kbr_2	
9	Row1	->	Helen3	Kbr_1	

Pin	Signal	I/O	Engine connection		Notes
10	Row6	->	Helen3	Kbr_6	
11	Row0	->	Helen3	Kbr_0	
12	Col0	->	Helen3	Kbc_0	
13	Row5	->	Helen3	Kbr_5	Voice switch connection
14	Row4	->	Helen3	Kbr_4	
15	GND		GND		
16	Col3	->	Helen3	Kbc_3	

Keyboard interface electrical characteristics

Description	Parameter	Min	Typ	Max	Unit	Notes
High-level input voltage	V_{IH}	0.65* V_{DDS}	V_{DDS}	0.3+ V_{DDS}	V	Row
Low-level input voltage	V_{IL}	-0.3	0	0.35* V_{DDS}	V	Row
High-level output voltage	V_{OH}	1.62	V_{DDS}	1.98	V	Column
Low-level output voltage	V_{OL}		0	0.45	V	Column
(VDDS = 1.8V)						

Fold unit connector

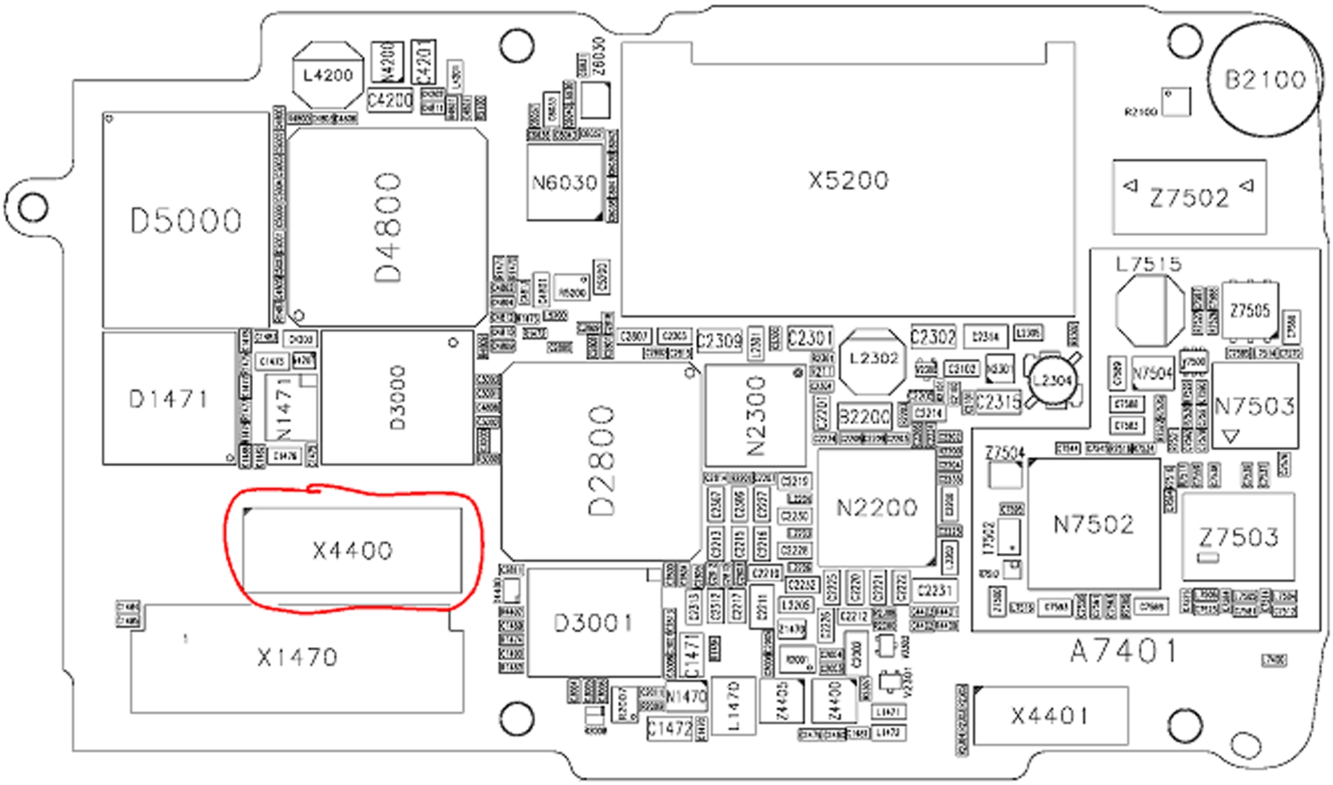
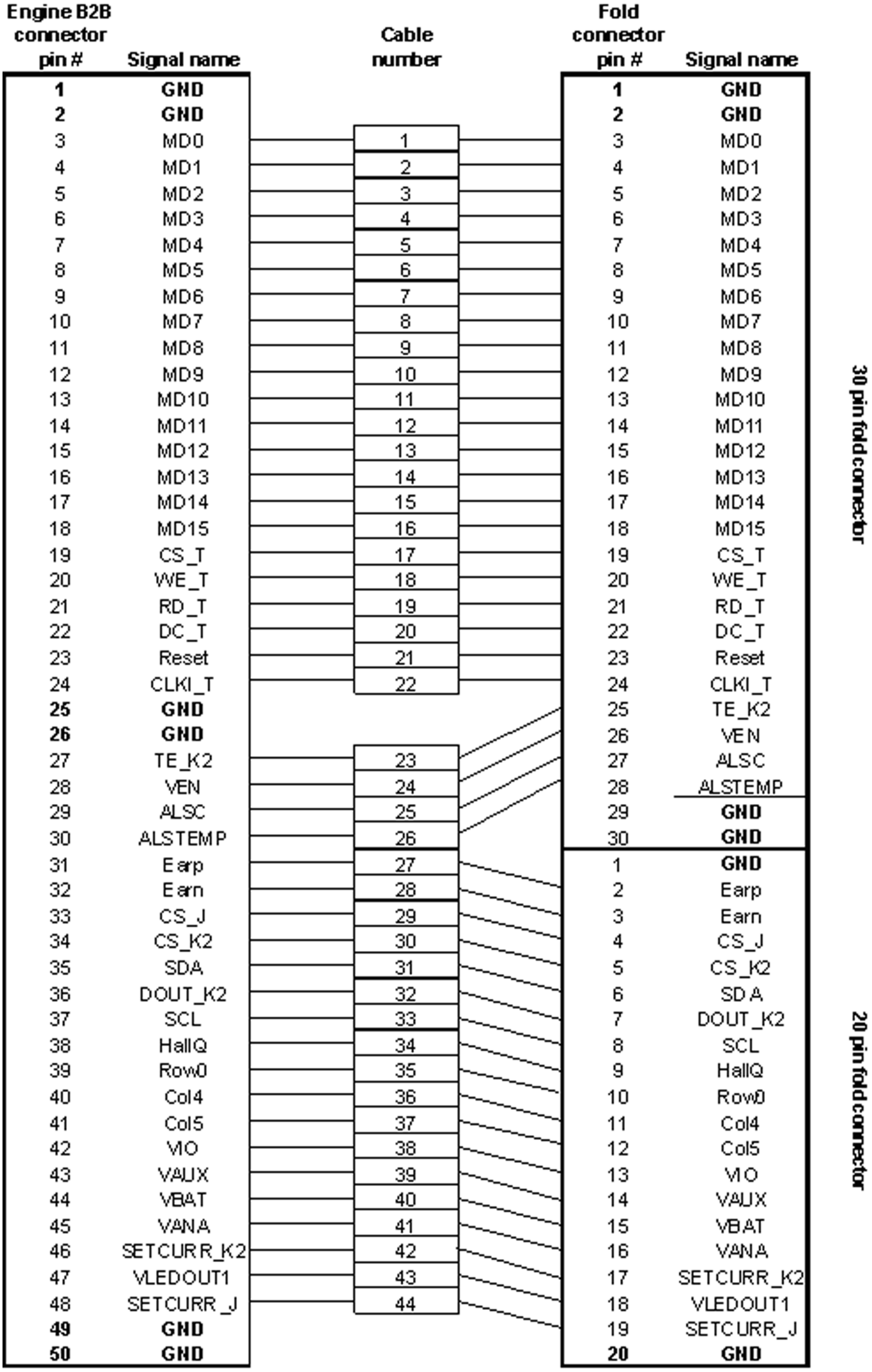

L4200
C4200
C4201
D5000
D4800
N6030
Z6030
X5200
B2100
R2100
Z7502
L7515
Z7505
N7504
N7503
D1471
N1471
D3000
D2800
C2309
C2301
C2302
L2302
N2300
B2200
L2304
C2315
N2200
C2231
Z7504
N7502
Z7503
X4400
D3001
X1470
A7401
X4401
N1470
C1472
C1471
L1470
Z4403
Z4400

Figure 114 Fold unit connector



Engine B2B connector pin #	Signal name	Cable number	Fold connector pin #	Signal name	
1	**GND**		**1**	**GND**	30 pin fold connector
2	**GND**		**2**	**GND**	
3	MD0	1	3	MD0	
4	MD1	2	4	MD1	
5	MD2	3	5	MD2	
6	MD3	4	6	MD3	
7	MD4	5	7	MD4	
8	MD5	6	8	MD5	
9	MD6	7	9	MD6	
10	MD7	8	10	MD7	
11	MD8	9	11	MD8	
12	MD9	10	12	MD9	
13	MD10	11	13	MD10	
14	MD11	12	14	MD11	
15	MD12	13	15	MD12	
16	MD13	14	16	MD13	
17	MD14	15	17	MD14	
18	MD15	16	18	MD15	
19	CS_T	17	19	CS_T	
20	WE_T	18	20	WE_T	
21	RD_T	19	21	RD_T	
22	DC_T	20	22	DC_T	
23	Reset	21	23	Reset	
24	CLKI_T	22	24	CLKI_T	
25	**GND**		25	TE_K2	
26	**GND**		26	VEN	
27	TE_K2	23	27	ALSC	
28	VEN	24	28	ALSTEMP	
29	ALSC	25	29	**GND**	
30	ALSTEMP	26	30	**GND**	
31	Earp	27	1	**GND**	20 pin fold connector
32	Earn	28	2	Earp	
33	CS_J	29	3	Earn	
34	CS_K2	30	4	CS_J	
35	SDA	31	5	CS_K2	
36	DOUT_K2	32	6	SDA	
37	SCL	33	7	DOUT_K2	
38	HallQ	34	8	SCL	
39	Row0	35	9	HallQ	
40	Col4	36	10	Row0	
41	Col5	37	11	Col4	
42	VIO	38	12	Col5	
43	VAUX	39	13	VIO	
44	VBAT	40	14	VAUX	
45	VANA	41	15	VBAT	
46	SETCURR_K2	42	16	VANA	
47	VLEDOUT1	43	17	SETCURR_K2	
48	SETCURR_J	44	18	VLEDOUT1	
49	**GND**		19	SETCURR_J	
50	**GND**		**20**	**GND**	

Figure 115 Connections between fold unit and engine board

Camera interface connections and electrical characteristics

Table 24 Interface signals between RM-42 BB and Toshiba camera DSP

Source pin name / function	Source	Destination	Destination pin name / function	Description
DOUTP	TSB DSP	Helen	ccpdap	CCP1 differential data +, output
DOUTM	TSB DSP	Helen	ccpdan	CCP1 differential data -, output
CLKOUTP	TSB DSP	Helen	CCP(3:0) CLK_P	CCP1 differential clock +, output
CLKOUTM	TSB DSP	Helen	CCP(3:0) CLK_N	CCP1 differential clock -, output
GPIO62	Helen	TSB DSP	SDA1	I^2C1 serial data from/to Helen
GPIO11	Helen	TSB DSP	SCL1	I^2C1 serial clock from/to Helen
cam_clk	Helen	TSB DSP	CLK	External clock
GPIO6	Helen	TSB DSP	RESET	Reset
ADRSEL	-	-	-	I^2C Address selector for TSB DSP (hardcoded)
PVDD15		-		1,5V power supply
RVDD28		-		2,8V power supply
LVDDR28R		-		2,8V power supply
LVDDR28D		-		2,8V power supply
MPUIO1	Helen	Regulator	EN	1,5V regulator enable
GPIO41	Helen	Regulator	VEN	2,8V regulator enable

Unagi camera module uses Stobe + and Strobe instead of Clock. D+ and D-.

Table 25 Interface signals between Toshiba camera DSP and Unagi 2Mpix AF camera module

Source pin name / function	Source	Destination	Destination pin name / function	Description
Dout+	Unagi	TSB DSP	DINP	CCP2 diff. data +, from camera
Dout-	Unagi	TSB DSP	DINM	CCP2 diff. data -, from camera
Sout+	Unagi	TSB DSP	CLKINP	CCP2 differential Strobe + *

Source pin name / function	Source	Destination	Destination pin name / function	Description
Sout-	Unagi	TSB DSP	CLKINM	CCP2 differential Strobe - *
SDA2	TSB DSP	Unagi	SDA	I^2C2 serial data to/ from Unagi
SCL2	TSB DSP	Unagi	SCL	I^2C2 serial clock to/ from Unagi
PWM1P	TSB DSP	Unagi	PWMA	PWMa output for AF SIDM
PWM1M	TSB DSP	Unagi	PWMB	PWMb output for AF SIDM
PWM2P	TSB DSP	Unagi	PWMC	PWMc output for AF SIDM
PWM2M	TSB DSP	Unagi	PWMD	PWMd output for AF SIDM
STPLS	TSB DSP	Flash driver	Flash enable	Strobe to flash led driver
GND		-		Ground
VDDI		-		1,5V power supply
VDDI		-		1,5V power supply
VDDI		-		1,5V power supply
VDD				2,8V power supply
VDD				2,8V power supply
VDD				2,8V power supply
GND		-		Ground
cam_clk	Helen	Unagi	CLK	External clock from Helen
GPIO6	Helen	Unagi	RESET	Reset

*) Unagi camera module uses Stobe + and Strobe instead of Clock. D+ and D-.

Table 26 Unagi Camera CCP IF electrical characteristics

Description	Parameter	Min	Typ	Max	Unit	Notes
Common mode voltage	VCMF	0.8	0.9	1	V	-1
Differential voltage swing	VOD	100	150	200	mV	-2
Operating frequency	fCLK	1		200	MHz	SW controls frequency

Description	Parameter	Min	Typ	Max	Unit	Notes
Differential rise and fall time		300		800	ps	-3

Note:

- Common mode voltage is a mean value of high and low states of one single-ended signal.
- Differential voltage swing is differential amplitude between signals of differential pair.
- Differential transitions should be only measured with good equipment (bandwith > 1GHz), otherwise results will seem too slow.

Table 27 Unagi Camera supply voltage characteristics

Description	Parameter	Min	Typ	Max	Unit
Camera analog voltage	VDD	2.6	2.8	2.9	V
Camera digital voltage	VDDI	1.4	1.5	1.6V	V

Table 28 Unagi Camera control IF electrical characteristics

Description	Parameter	Min	Typ	Max	Unit	Notes
ExtClk	VIH square wave	0.8 x VDD	-	VDD	V	High-level input voltage
ExtClk	VIL square wave	0	-	0.54	V	Low-level input voltage
ExtClk	p-p sinusoidal wave	0.5	-	1.2	V	Sinusoidal mode voltage swing
ExtClk	Frequency		9.6		MHz	SW controlled frequency
SDA, SCL	VIH	0.7 x VDD	1.8	VDD	V	High-level input voltage
SDA, SCL	VIL	0	-	0.54	V	Low-level input voltage
SDA	VOL	0	-	0.4	V	Low-level output voltage

Description	Parameter	Min	Typ	Max	Unit	Notes
RST	VIH	1.5	1.8	VDD	V	High-level input voltage
RST	VIL	0	-	0.54	V	Low-level input voltage
PWM a, b, c, d	VIH	2.5			V	High-level input voltage
PWM a, b, c, d	VIL			0.3	V	Low-level input voltage

Table 29 Camera DSP supply voltage characteristics

Description	Parameter	Min	Typ	Max	Unit	Notes
Camera DSP analog voltage	VDD	2.6	2.8	3.0	V	
Camera DSP digital voltage	VDDI	1.4	1.5	1.6	V	

Table 30 Camera DSP control IF electrical characteristics

Description	Parameter	Min	Typ	Max	Unit	Notes
ExtClk	VIH square wave	VDD x 0.8	-	VDD	V	High-level input voltage
ExtClk	VIL square wave	0	-	0.22 x VDD	V	Low-level input voltage
ExtClk	p-p sinusoidal wave	0.5	-	1.2	V	Sinusoidal mode voltage swing
ExtClk	Frequency		9.6		MHz	SW controlled frequency
SDA1, SCL1, SDA2, SCL2	VIH	1.5	1.8	VDD	V	High-level input voltage

Description	Parameter	Min	Typ	Max	Unit	Notes
SDA1, SCL1, SDA2, SCL2	VIL	0	-	0.54	V	Low-level input voltage
SDA	VOL	0	-	0.4	V	Low-level output voltage
RST	VIH	1.5	1.8	VDD	V	High-level input voltage
RST	VIL	0	-	0.2 x VDD	V	Low-level input voltage
STPLS	VOH	0.8 x VDD	-	VDD	V	High-level output voltage
STPLS	VOL	0	-	0.2 x VDD	V	Low-level output voltage
PWM1P, PWM1M, PWM2P, PWM2M	VOH	0.8 x VDD	-	VDD	V	High-level output voltage
PWM1P, PWM1M, PWM2P, PWM2M	VOL	0	-	0.2 x VDD	V	Low-level output voltage

Table 31 Camera DSP CCP IF electrical characteristics

Description	Parameter	Min	Typ	Max	Unit	Notes
Common mode voltage	VCMF	0.8	0.9	1.0	V	-1
Differential voltage swing	VOD	100	150	200	mV	-2
Operating frequency	fCLK	1		200	MHz	
Differential rise and fall time		300		800	ps	-3
Clock duty cycle		40	50	60	%	

Note:

- Common mode voltage is a mean value of high and low states of one single-ended signal.
- Differential voltage swing is differential amplitude between signals of differential pair.
- Differential transitions should be only measured with good equipment (bandwith > 1GHz), otherwise results will seem too slow.

Table 32 Camera system regulators IF electrical characteristics

Description	Parameter	Min	Typ	Max	Unit	Notes
Vcam1V5 regulator enable	VOH				V	Helen3 GPIO High-level output voltage
Vcam1V5 regulator enable	VOL				V	Helen3 GPIO Low-level output voltage
Vcam2V8 regulator enable	VOH				V	Helen3 GPIO High-level output voltage
Vcam2V8 regulator enable	VOL				V	Helen3 GPIO Low-level output voltage

Back-up battery interface connections and electrical characteristics

Table 33 Back-up battery connections

Pin name	I/O	Connection	Notes
L2207, VBack	->	N2200, VBack	Back-up battery G2200 is connected to N2200 via coil

Table 34 Back-up battery electrical characteristics

Description	Parameter	Min	Typ	Max	Unit
Back-Up Battery Voltage	Vback	0	2.5	2.7	V

RF description

Introduction to receiver functionality

Receiver functions are implemented in an RF ASIC.

The receiver is a linear direct conversion receiver consisting of separate front ends (LNA (Low Noise Amplifier) and demodulator) for each supported system. After the demodulators, the signal paths are combined to one common BB path.

WCDMA receiver functionality

In the WCDMA mode, the received signal is fed from the antenna to a duplex filter. After the duplex filter the signal goes via a balun to an LNA (Low Noise Amplifier) residing in N7500. From the LNA, the signal goes trough a band pass filter.

After filtering, the signal goes to the down conversion mixer, which converts the signal to baseband I and Q signals. At the BB frequency the signal is amplified, and fed to a low pass filter. The Rx channel filter must be calibrated with an automatic routine whenever the Rx ASIC IC is changed to a phone.

In the WCDMA mode, the corner frequency of the filter is set to approximately 2.1 MHz. The filter is followed by an AGC (Automatic Gain Control) amplifier with an adjustable gain. The signal is further amplified before it is fed to balanced analogue IQ output pins. The analogue output pins are accompanied by reference voltage output, which sets the DC level for the AD converter in the BB ASIC RAP.

The last stage of the RF Rx chain is an output buffer which feeds the signal and a reference voltage (VREFCM) to the BB ASIC. The AGC stages are used to maintain the voltage swing at the input of the AD converters at an adequate level.

GSM receiver

As GSM Rx branches are functionally identical, the following description is applicable to all of them.

The received signal goes from the GSM antenna to the antenna switch module. The antenna switch module contains PIN diode switches for a band and Rx/Tx selection and also Rx SAW filters.

The antenna switch module is followed by integrated LNAs residing in the Rx ASIC.

The LNAs are followed by demodulators which downconvert the signal to baseband I and Q signals.

After the down conversion mixer, the Rx chain is similar to the WCDMA Rx. The channel select filter is set to 115 kHz in the GSM mode.

Introduction to transmitter functionality

Transmitter functions are implemented in an RF ASIC. The ASIC contains a BB frequency low pass filter, which is tunable according to the signal bandwidth of the system in use.

In addition, the ASIC contains separate RF paths comprising a final frequency IQ modulator and VGA amplifiers.

WCDMA transmitter functionality

In the transmitter side, an analogue I/Q modulated signal is received from digital baseband into an RF ASIC and feed through a low pass filter. After the filter the signal is feed to the IQ modulator, which converts the signal to final Tx frequency. There are two separate I/Q modulators: one for WCDMA and another for GSM signals. The modulator is followed by two VGA stages giving 85 dB of gain control range. The signal then exits the RF ASIC via a balanced line. Next, the signal is band pass filtered by a SAW filter before it is fed to the WCDMA PA module. After the PA, the transmitted WCDMA signal is fed through an isolator and a duplex filter to the antenna.

WCDMA power control

WCDMA Tx power control is accomplished by the two VGA amplifier stages in the Tx ASIC.

The VGAs have a common temperature compensation circuit and one voltage mode analogue input for gain control (TXC).

The gain of the VGA amplifier chain is controlled by a DA converter in BB. The same DA converter is shared by GSM Tx power control function.

A sample of the output power is taken by a capacitor between the power amplifier and the isolator, and fed to a diode power detector. The output of the detector is low pass filtered, and the voltage is then AD converted in BB.

Another function of the detector voltage is to steer the DC/DC converter, which is providing a variable supply voltage for the WCDMA PA.

WCDMA PA module

The WCDMA PA is housed in a separate module having:

- a variable supply voltage input for the amplifier stages (Vcc11),
- a battery supply voltage for the bias circuits (Vcc12),
- and two bias current inputs.

Bias currents are generated by 5-bit DA converters in the RF ASIC. The converters are controlled by BB via RFBus.

If a different manufacturer's PA is changed to the phone, this setting must be set again.

The bias currents are also used as PA on/off controls. The supply voltage for the output stage is got from a DC/DC converter in order to improve the efficiency at low power levels.

PA DC/DC converter

The control of the DC/DC converter is fed back from the power detector circuit.

The DC/DC converter limits the lowest supply voltage to 1.5 V. At highest power levels, the DC/DC converter output settles nominally to 3.2 V.

GSM transmitter functionality

An RF ASIC receives an analogue IQ modulated signal from digital BB, which is first low pass filtered with filter corner frequency set to approximately 200 kHz. After the filter, the signal is routed to the GSM modulator. The amplifier gives 40 dB of power control dynamic range.

After the VGA stage the signal exits the RF ASIC. In case of GSM1800/1900 the signal goes directly to the GSM PA module. In case of EGSM900 (and GSM850), the PA module is preceded by a SAW filter. After the filter, the signal is fed to the GSM PA module. Finally, the signal is routed via the antenna switch to the antenna.

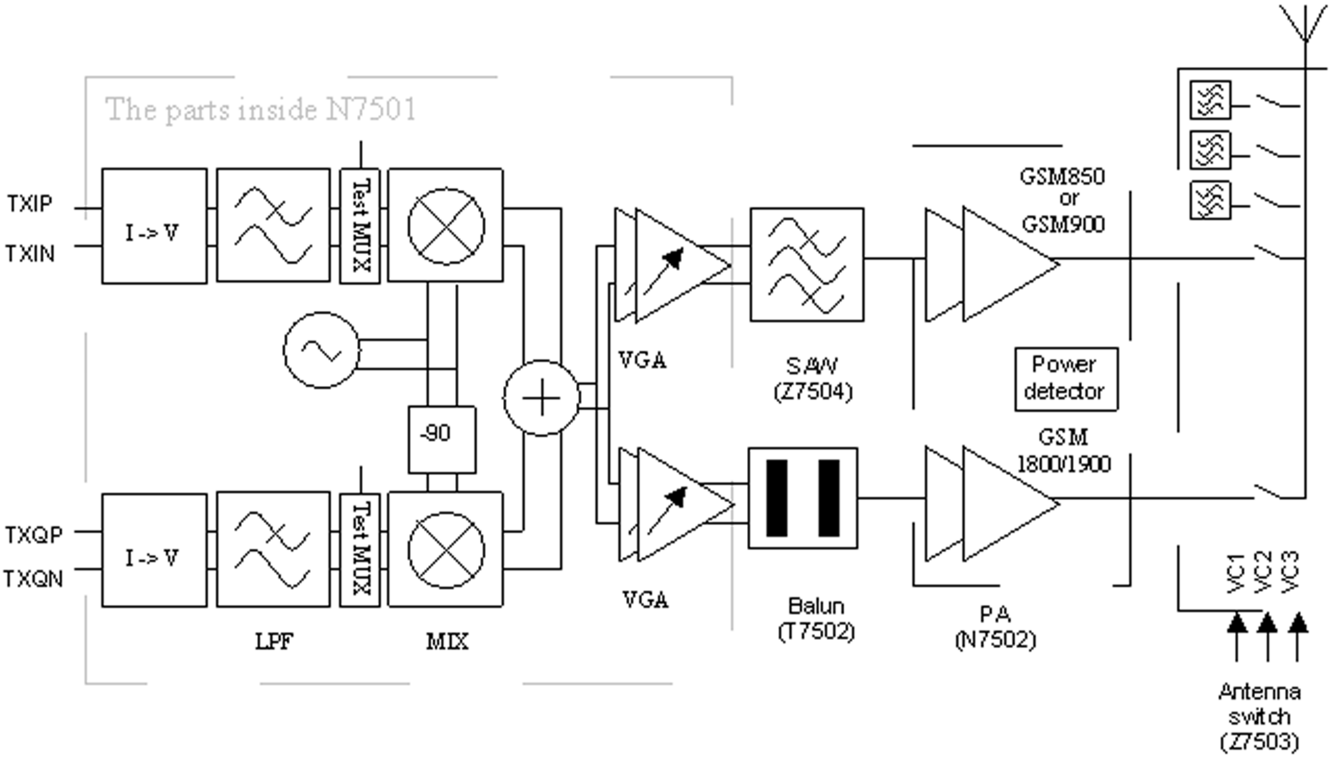

The parts inside N7501
TXIP
TXIN
I -> V
Test MUX
-90
TXQP
TXQN
I -> V
Test MUX
LPF
MIX
VGA
VGA
SAW
(Z7504)
Balun
(T7502)
GSM850
or
GSM900
Power
detector
GSM
1800/1900
PA
(N7502)
VC1
VC2
VC3
Antenna
switch
(Z7503)

Figure 116 GSM transmitter

GSM power control

A closed control loop comprise an integrated power detector (in PA module) and an error amplifier. The error amplifier resides in N7501, and it controls the transmitter power of GSM.

Detector output from the PA gives a DC level proportional to the output power. The DC voltage is fed to the negative input of the error amplifier, where it is compared to the level of the reference signal, TXC. TXC is got from the BB circuitry. The output of the error amplifier is fed to a buffer amplifier, which in turn steers the VGA amplifier.

The power control loop is enabled and disabled by writing an appropriate register in N7501 RF ASIC. In case of dual slot transmission, the output power is ramped down between the consecutive slots.

GSM PA module

A single GSM/EDGE PA module contains two separate amplifier chains, one for EGSM900 (and GSM850) and another for GSM1800/1900. Both amplifiers have a battery supply connection and two bias current inputs.

Frequency synthesizers

RF has separate synthesizers for Rx and Tx. Both synthesizers consist of:

- PLL (Phase-Locked Loop)
- loop filter
- VCO (Voltage Controlled Oscillator)
- balun

The VCO frequencies are locked by PLLs into a reference oscillator, VCTCXO (Voltage Controlled Temperature Compensated Crystal Oscillator).

The PLLs are located in RF ASICs and controlled via RFBus.

The VCOs operate at the channel frequency multiplied by two in the upper bands and by four in EGSM900 (and GSM850, if applicable). The required frequency dividers required for modulators and demodulators are integrated into RF ASICs. The dividers are controlled via RFBus.

Reference oscillators

A 38.4MHz VCTCXO is used as a reference oscillator for the frequency synthesizers.

The output signal of the VCTCXO is directly connected to both RF ASICs where it is used as synthesizer reference. The other RF ASIC also contains a balanced buffered output for supplying the clock signal to the digital BB ASIC and a single ended buffer for Bluetooth and WLAN* (* = if applicable).

The frequency of the reference oscillator is locked into the frequency of the base station with the help of an AFC (Automatic Frequency Control) voltage, which is generated in BB by a DSP (Digital Signal Processor) and converted by a dedicated DAC (Digital-to-Analogue-Converter).

Regulators

RF ASICs contain integrated regulators to supply regulated voltages for their internal circuitry and other RF parts. Rx VCO supply is got via a switch from an RF ASIC VR1 regulator. VCO can be switched on and off by controlling the switch via RFBus.

Supply voltage for the VCTCXO is provided by a BB mixed mode ASIC. The same supply is used for reference clock input buffers, output buffers and for the digital control blocks of both RF ASICs.

Other supplies, like 4.7 V supply for PLL charge pumps and bias reference (VREFRF01) are also provided by the BB mixed mode ASIC.

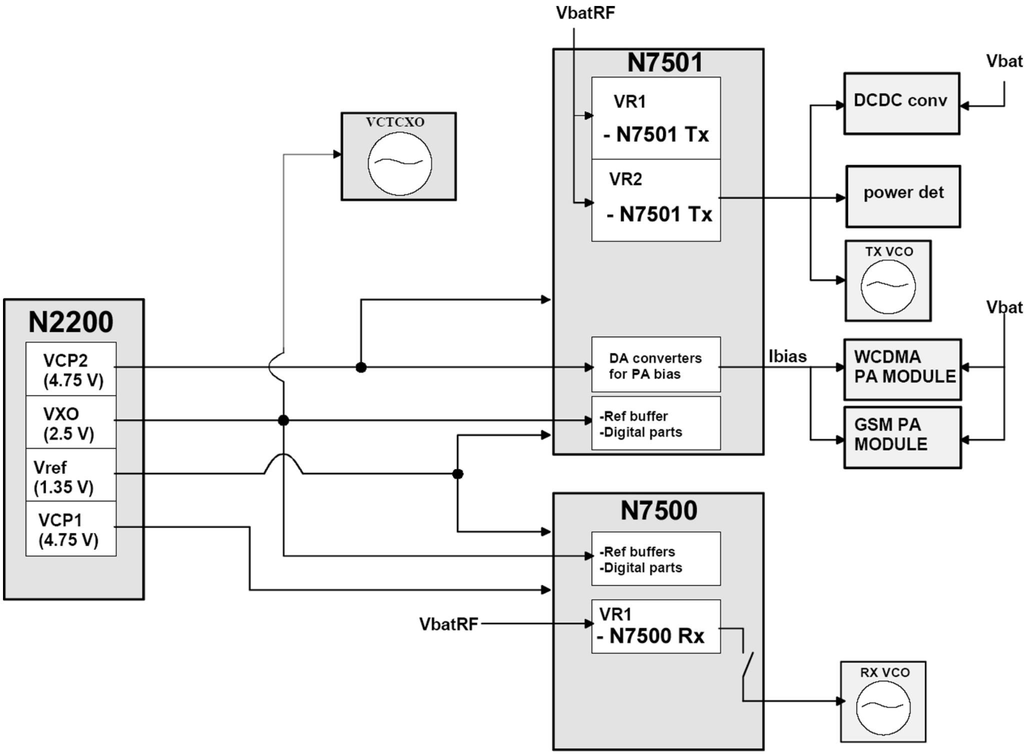

VbatRF
N7501
VR1
- N7501 Tx
VR2
- N7501 Tx
Vbat
DCDC conv
power det
TX VCO
VCTCXO
N2200
VCP2
(4.75 V)
VXO
(2.5 V)
Vref
(1.35 V)
VCP1
(4.75 V)
DA converters
for PA bias
-Ref buffer
-Digital parts
Ibias
Vbat
WCDMA
PA MODULE
GSM PA
MODULE
N7500
-Ref buffers
-Digital parts
VbatRF
VR1
- N7500 Rx
RX VCO

Figure 117 RF supply connections from the BB mixed mode ASIC

Frequency mappings

EGSM900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
975	880,2	925,2	3520,8	3700,8	1	890,2	935,2	3560,8	3740,8	63	902,6	947,6	3610,4	3790,4
976	880,4	925,4	3521,6	3701,6	2	890,4	935,4	3561,6	3741,6	64	902,8	947,8	3611,2	3791,2
977	880,6	925,6	3522,4	3702,4	3	890,6	935,6	3562,4	3742,4	65	903,0	948,0	3612,0	3792,0
978	880,8	925,8	3523,2	3703,2	4	890,8	935,8	3563,2	3743,2	66	903,2	948,2	3612,8	3792,8
979	881,0	926,0	3524,0	3704,0	5	891,0	936,0	3564,0	3744,0	67	903,4	948,4	3613,6	3793,6
980	881,2	926,2	3524,8	3704,8	6	891,2	936,2	3564,8	3744,8	68	903,6	948,6	3614,4	3794,4
981	881,4	926,4	3525,6	3705,6	7	891,4	936,4	3565,6	3745,6	69	903,8	948,8	3615,2	3795,2
982	881,6	926,6	3526,4	3706,4	8	891,6	936,6	3566,4	3746,4	70	904,0	949,0	3616,0	3796,0
983	881,8	926,8	3527,2	3707,2	9	891,8	936,8	3567,2	3747,2	71	904,2	949,2	3616,8	3796,8
984	882,0	927,0	3528,0	3708,0	10	892,0	937,0	3568,0	3748,0	72	904,4	949,4	3617,6	3797,6
985	882,2	927,2	3528,8	3708,8	11	892,2	937,2	3568,8	3748,8	73	904,6	949,6	3618,4	3798,4
986	882,4	927,4	3529,6	3709,6	12	892,4	937,4	3569,6	3749,6	74	904,8	949,8	3619,2	3799,2
987	882,6	927,6	3530,4	3710,4	13	892,6	937,6	3570,4	3750,4	75	905,0	950,0	3620,0	3800,0
988	882,8	927,8	3531,2	3711,2	14	892,8	937,8	3571,2	3751,2	76	905,2	950,2	3620,8	3800,8
989	883,0	928,0	3532,0	3712,0	15	893,0	938,0	3572,0	3752,0	77	905,4	950,4	3621,6	3801,6
990	883,2	928,2	3532,8	3712,8	16	893,2	938,2	3572,8	3752,8	78	905,6	950,6	3622,4	3802,4
991	883,4	928,4	3533,6	3713,6	17	893,4	938,4	3573,6	3753,6	79	905,8	950,8	3623,2	3803,2
992	883,6	928,6	3534,4	3714,4	18	893,6	938,6	3574,4	3754,4	80	906,0	951,0	3624,0	3804,0
993	883,8	928,8	3535,2	3715,2	19	893,8	938,8	3575,2	3755,2	81	906,2	951,2	3624,8	3804,8
994	884,0	929,0	3536,0	3716,0	20	894,0	939,0	3576,0	3756,0	82	906,4	951,4	3625,6	3805,6
995	884,2	929,2	3536,8	3716,8	21	894,2	939,2	3576,8	3756,8	83	906,6	951,6	3626,4	3806,4
996	884,4	929,4	3537,6	3717,6	22	894,4	939,4	3577,6	3757,6	84	906,8	951,8	3627,2	3807,2
997	884,6	929,6	3538,4	3718,4	23	894,6	939,6	3578,4	3758,4	85	907,0	952,0	3628,0	3808,0
998	884,8	929,8	3539,2	3719,2	24	894,8	939,8	3579,2	3759,2	86	907,2	952,2	3628,8	3808,8
999	885,0	930,0	3540,0	3720,0	25	895,0	940,0	3580,0	3760,0	87	907,4	952,4	3629,6	3809,6
1000	885,2	930,2	3540,8	3720,8	26	895,2	940,2	3580,8	3760,8	88	907,6	952,6	3630,4	3810,4
1001	885,4	930,4	3541,6	3721,6	27	895,4	940,4	3581,6	3761,6	89	907,8	952,8	3631,2	3811,2
1002	885,6	930,6	3542,4	3722,4	28	895,6	940,6	3582,4	3762,4	90	908,0	953,0	3632,0	3812,0
1003	885,8	930,8	3543,2	3723,2	29	895,8	940,8	3583,2	3763,2	91	908,2	953,2	3632,8	3812,8
1004	886,0	931,0	3544,0	3724,0	30	896,0	941,0	3584,0	3764,0	92	908,4	953,4	3633,6	3813,6
1005	886,2	931,2	3544,8	3724,8	31	896,2	941,2	3584,8	3764,8	93	908,6	953,6	3634,4	3814,4
1006	886,4	931,4	3545,6	3725,6	32	896,4	941,4	3585,6	3765,6	94	908,8	953,8	3635,2	3815,2
1007	886,6	931,6	3546,4	3726,4	33	896,6	941,6	3586,4	3766,4	95	909,0	954,0	3636,0	3816,0
1008	886,8	931,8	3547,2	3727,2	34	896,8	941,8	3587,2	3767,2	96	909,2	954,2	3636,8	3816,8
1009	887,0	932,0	3548,0	3728,0	35	897,0	942,0	3588,0	3768,0	97	909,4	954,4	3637,6	3817,6
1010	887,2	932,2	3548,8	3728,8	36	897,2	942,2	3588,8	3768,8	98	909,6	954,6	3638,4	3818,4
1011	887,4	932,4	3549,6	3729,6	37	897,4	942,4	3589,6	3769,6	99	909,8	954,8	3639,2	3819,2
1012	887,6	932,6	3550,4	3730,4	38	897,6	942,6	3590,4	3770,4	100	910,0	955,0	3640,0	3820,0
1013	887,8	932,8	3551,2	3731,2	39	897,8	942,8	3591,2	3771,2	101	910,2	955,2	3640,8	3820,8
1014	888,0	933,0	3552,0	3732,0	40	898,0	943,0	3592,0	3772,0	102	910,4	955,4	3641,6	3821,6
1015	888,2	933,2	3552,8	3732,8	41	898,2	943,2	3592,8	3772,8	103	910,6	955,6	3642,4	3822,4
1016	888,4	933,4	3553,6	3733,6	42	898,4	943,4	3593,6	3773,6	104	910,8	955,8	3643,2	3823,2
1017	888,6	933,6	3554,4	3734,4	43	898,6	943,6	3594,4	3774,4	105	911,0	956,0	3644,0	3824,0
1018	888,8	933,8	3555,2	3735,2	44	898,8	943,8	3595,2	3775,2	106	911,2	956,2	3644,8	3824,8
1019	889,0	934,0	3556,0	3736,0	45	899,0	944,0	3596,0	3776,0	107	911,4	956,4	3645,6	3825,6
1020	889,2	934,2	3556,8	3736,8	46	899,2	944,2	3596,8	3776,8	108	911,6	956,6	3646,4	3826,4
1021	889,4	934,4	3557,6	3737,6	47	899,4	944,4	3597,6	3777,6	109	911,8	956,8	3647,2	3827,2
1022	889,6	934,6	3558,4	3738,4	48	899,6	944,6	3598,4	3778,4	110	912,0	957,0	3648,0	3828,0
1023	889,8	934,8	3559,2	3739,2	49	899,8	944,8	3599,2	3779,2	111	912,2	957,2	3648,8	3828,8
0	890,0	935,0	3560,0	3740,0	50	900,0	945,0	3600,0	3780,0	112	912,4	957,4	3649,6	3829,6
					51	900,2	945,2	3600,8	3780,8	113	912,6	957,6	3650,4	3830,4
					52	900,4	945,4	3601,6	3781,6	114	912,8	957,8	3651,2	3831,2
					53	900,6	945,6	3602,4	3782,4	115	913,0	958,0	3652,0	3832,0
					54	900,8	945,8	3603,2	3783,2	116	913,2	958,2	3652,8	3832,8
					55	901,0	946,0	3604,0	3784,0	117	913,4	958,4	3653,6	3833,6
					56	901,2	946,2	3604,8	3784,8	118	913,6	958,6	3654,4	3834,4
					57	901,4	946,4	3605,6	3785,6	119	913,8	958,8	3655,2	3835,2
					58	901,6	946,6	3606,4	3786,4	120	914,0	959,0	3656,0	3836,0
					59	901,8	946,8	3607,2	3787,2	121	914,2	959,2	3656,8	3836,8
					60	902,0	947,0	3608,0	3788,0	122	914,4	959,4	3657,6	3837,6
					61	902,2	947,2	3608,8	3788,8	123	914,6	959,6	3658,4	3838,4
					62	902,4	947,4	3609,6	3789,6	124	914,8	959,8	3659,2	3839,2

GSM1800 frequencies

Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx
512	1710.2	1805.2	3420.4	3610.4	606	1729.0	1824.0	3458.0	3648.0	700	1747.8	1842.8	3495.6	3685.6	793	1766.4	1861.4	3532.8	3722.8
513	1710.4	1805.4	3420.8	3610.8	607	1729.2	1824.2	3458.4	3648.4	701	1748.0	1843.0	3496.0	3686.0	794	1766.6	1861.6	3533.2	3723.2
514	1710.6	1805.6	3421.2	3611.2	608	1729.4	1824.4	3458.8	3648.8	702	1748.2	1843.2	3496.4	3686.4	795	1766.8	1861.8	3533.6	3723.6
515	1710.8	1805.8	3421.6	3611.6	609	1729.6	1824.6	3459.2	3649.2	703	1748.4	1843.4	3496.8	3686.8	796	1767.0	1862.0	3534.0	3724.0
516	1711.0	1806.0	3422.0	3612.0	610	1729.8	1824.8	3459.6	3649.6	704	1748.6	1843.6	3497.2	3687.2	797	1767.2	1862.2	3534.4	3724.4
517	1711.2	1806.2	3422.4	3612.4	611	1730.0	1825.0	3460.0	3650.0	705	1748.8	1843.8	3497.6	3687.6	798	1767.4	1862.4	3534.8	3724.8
518	1711.4	1806.4	3422.8	3612.8	612	1730.2	1825.2	3460.4	3650.4	706	1749.0	1844.0	3498.0	3688.0	799	1767.6	1862.6	3535.2	3725.2
519	1711.6	1806.6	3423.2	3613.2	613	1730.4	1825.4	3460.8	3650.8	707	1749.2	1844.2	3498.4	3688.4	800	1767.8	1862.8	3535.6	3725.6
520	1711.8	1806.8	3423.6	3613.6	614	1730.6	1825.6	3461.2	3651.2	708	1749.4	1844.4	3498.8	3688.8	801	1768.0	1863.0	3536.0	3726.0
521	1712.0	1807.0	3424.0	3614.0	615	1730.8	1825.8	3461.6	3651.6	709	1749.6	1844.6	3499.2	3689.2	802	1768.2	1863.2	3536.4	3726.4
522	1712.2	1807.2	3424.4	3614.4	616	1731.0	1826.0	3462.0	3652.0	710	1749.8	1844.8	3499.6	3689.6	803	1768.4	1863.4	3536.8	3726.8
523	1712.4	1807.4	3424.8	3614.8	617	1731.2	1826.2	3462.4	3652.4	711	1750.0	1845.0	3500.0	3690.0	804	1768.6	1863.6	3537.2	3727.2
524	1712.6	1807.6	3425.2	3615.2	618	1731.4	1826.4	3462.8	3652.8	712	1750.2	1845.2	3500.4	3690.4	805	1768.8	1863.8	3537.6	3727.6
525	1712.8	1807.8	3425.6	3615.6	619	1731.6	1826.6	3463.2	3653.2	713	1750.4	1845.4	3500.8	3690.8	806	1769.0	1864.0	3538.0	3728.0
526	1713.0	1808.0	3426.0	3616.0	620	1731.8	1826.8	3463.6	3653.6	714	1750.6	1845.6	3501.2	3691.2	807	1769.2	1864.2	3538.4	3728.4
527	1713.2	1808.2	3426.4	3616.4	621	1732.0	1827.0	3464.0	3654.0	715	1750.8	1845.8	3501.6	3691.6	808	1769.4	1864.4	3538.8	3728.8
528	1713.4	1808.4	3426.8	3616.8	622	1732.2	1827.2	3464.4	3654.4	716	1751.0	1846.0	3502.0	3692.0	809	1769.6	1864.6	3539.2	3729.2
529	1713.6	1808.6	3427.2	3617.2	623	1732.4	1827.4	3464.8	3654.8	717	1751.2	1846.2	3502.4	3692.4	810	1769.8	1864.8	3539.6	3729.6
530	1713.8	1808.8	3427.6	3617.6	624	1732.6	1827.6	3465.2	3655.2	718	1751.4	1846.4	3502.8	3692.8	811	1770.0	1865.0	3540.0	3730.0
531	1714.0	1809.0	3428.0	3618.0	625	1732.8	1827.8	3465.6	3655.6	719	1751.6	1846.6	3503.2	3693.2	812	1770.2	1865.2	3540.4	3730.4
532	1714.2	1809.2	3428.4	3618.4	626	1733.0	1828.0	3466.0	3656.0	720	1751.8	1846.8	3503.6	3693.6	813	1770.4	1865.4	3540.8	3730.8
533	1714.4	1809.4	3428.8	3618.8	627	1733.2	1828.2	3466.4	3656.4	721	1752.0	1847.0	3504.0	3694.0	814	1770.6	1865.6	3541.2	3731.2
534	1714.6	1809.6	3429.2	3619.2	628	1733.4	1828.4	3466.8	3656.8	722	1752.2	1847.2	3504.4	3694.4	815	1770.8	1865.8	3541.6	3731.6
535	1714.8	1809.8	3429.6	3619.6	629	1733.6	1828.6	3467.2	3657.2	723	1752.4	1847.4	3504.8	3694.8	816	1771.0	1866.0	3542.0	3732.0
536	1715.0	1810.0	3430.0	3620.0	630	1733.8	1828.8	3467.6	3657.6	724	1752.6	1847.6	3505.2	3695.2	817	1771.2	1866.2	3542.4	3732.4
537	1715.2	1810.2	3430.4	3620.4	631	1734.0	1829.0	3468.0	3658.0	725	1752.8	1847.8	3505.6	3695.6	818	1771.4	1866.4	3542.8	3732.8
538	1715.4	1810.4	3430.8	3620.8	632	1734.2	1829.2	3468.4	3658.4	726	1753.0	1848.0	3506.0	3696.0	819	1771.6	1866.6	3543.2	3733.2
539	1715.6	1810.6	3431.2	3621.2	633	1734.4	1829.4	3468.8	3658.8	727	1753.2	1848.2	3506.4	3696.4	820	1771.8	1866.8	3543.6	3733.6
540	1715.8	1810.8	3431.6	3621.6	634	1734.6	1829.6	3469.2	3659.2	728	1753.4	1848.4	3506.8	3696.8	821	1772.0	1867.0	3544.0	3734.0
541	1716.0	1811.0	3432.0	3622.0	635	1734.8	1829.8	3469.6	3659.6	729	1753.6	1848.6	3507.2	3697.2	822	1772.2	1867.2	3544.4	3734.4
542	1716.2	1811.2	3432.4	3622.4	636	1735.0	1830.0	3470.0	3660.0	730	1753.8	1848.8	3507.6	3697.6	823	1772.4	1867.4	3544.8	3734.8
543	1716.4	1811.4	3432.8	3622.8	637	1735.2	1830.2	3470.4	3660.4	731	1754.0	1849.0	3508.0	3698.0	824	1772.6	1867.6	3545.2	3735.2
544	1716.6	1811.6	3433.2	3623.2	638	1735.4	1830.4	3470.8	3660.8	732	1754.2	1849.2	3508.4	3698.4	825	1772.8	1867.8	3545.6	3735.6
545	1716.8	1811.8	3433.6	3623.6	639	1735.6	1830.6	3471.2	3661.2	733	1754.4	1849.4	3508.8	3698.8	826	1773.0	1868.0	3546.0	3736.0
546	1717.0	1812.0	3434.0	3624.0	640	1735.8	1830.8	3471.6	3661.6	734	1754.6	1849.6	3509.2	3699.2	827	1773.2	1868.2	3546.4	3736.4
547	1717.2	1812.2	3434.4	3624.4	641	1736.0	1831.0	3472.0	3662.0	735	1754.8	1849.8	3509.6	3699.6	828	1773.4	1868.4	3546.8	3736.8
548	1717.4	1812.4	3434.8	3624.8	642	1736.2	1831.2	3472.4	3662.4	736	1755.0	1850.0	3510.0	3700.0	829	1773.6	1868.6	3547.2	3737.2
549	1717.6	1812.6	3435.2	3625.2	643	1736.4	1831.4	3472.8	3662.8	737	1755.2	1850.2	3510.4	3700.4	830	1773.8	1868.8	3547.6	3737.6
550	1717.8	1812.8	3435.6	3625.6	644	1736.6	1831.6	3473.2	3663.2	738	1755.4	1850.4	3510.8	3700.8	831	1774.0	1869.0	3548.0	3738.0
551	1718.0	1813.0	3436.0	3626.0	645	1736.8	1831.8	3473.6	3663.6	739	1755.6	1850.6	3511.2	3701.2	832	1774.2	1869.2	3548.4	3738.4
552	1718.2	1813.2	3436.4	3626.4	646	1737.0	1832.0	3474.0	3664.0	740	1755.8	1850.8	3511.6	3701.6	833	1774.4	1869.4	3548.8	3738.8
553	1718.4	1813.4	3436.8	3626.8	647	1737.2	1832.2	3474.4	3664.4	741	1756.0	1851.0	3512.0	3702.0	834	1774.6	1869.6	3549.2	3739.2
554	1718.6	1813.6	3437.2	3627.2	648	1737.4	1832.4	3474.8	3664.8	742	1756.2	1851.2	3512.4	3702.4	835	1774.8	1869.8	3549.6	3739.6
555	1718.8	1813.8	3437.6	3627.6	649	1737.6	1832.6	3475.2	3665.2	743	1756.4	1851.4	3512.8	3702.8	836	1775.0	1870.0	3550.0	3740.0
556	1719.0	1814.0	3438.0	3628.0	650	1737.8	1832.8	3475.6	3665.6	744	1756.6	1851.6	3513.2	3703.2	837	1775.2	1870.2	3550.4	3740.4
557	1719.2	1814.2	3438.4	3628.4	651	1738.0	1833.0	3476.0	3666.0	745	1756.8	1851.8	3513.6	3703.6	838	1775.4	1870.4	3550.8	3740.8
558	1719.4	1814.4	3438.8	3628.8	652	1738.2	1833.2	3476.4	3666.4	746	1757.0	1852.0	3514.0	3704.0	839	1775.6	1870.6	3551.2	3741.2
559	1719.6	1814.6	3439.2	3629.2	653	1738.4	1833.4	3476.8	3666.8	747	1757.2	1852.2	3514.4	3704.4	840	1775.8	1870.8	3551.6	3741.6
560	1719.8	1814.8	3439.6	3629.6	654	1738.6	1833.6	3477.2	3667.2	748	1757.4	1852.4	3514.8	3704.8	841	1776.0	1871.0	3552.0	3742.0
561	1720.0	1815.0	3440.0	3630.0	655	1738.8	1833.8	3477.6	3667.6	749	1757.6	1852.6	3515.2	3705.2	842	1776.2	1871.2	3552.4	3742.4
562	1720.2	1815.2	3440.4	3630.4	656	1739.0	1834.0	3478.0	3668.0	750	1757.8	1852.8	3515.6	3705.6	843	1776.4	1871.4	3552.8	3742.8
563	1720.4	1815.4	3440.8	3630.8	657	1739.2	1834.2	3478.4	3668.4	751	1758.0	1853.0	3516.0	3706.0	844	1776.6	1871.6	3553.2	3743.2
564	1720.6	1815.6	3441.2	3631.2	658	1739.4	1834.4	3478.8	3668.8	752	1758.2	1853.2	3516.4	3706.4	845	1776.8	1871.8	3553.6	3743.6
565	1720.8	1815.8	3441.6	3631.6	659	1739.6	1834.6	3479.2	3669.2	753	1758.4	1853.4	3516.8	3706.8	846	1777.0	1872.0	3554.0	3744.0
566	1721.0	1816.0	3442.0	3632.0	660	1739.8	1834.8	3479.6	3669.6	754	1758.6	1853.6	3517.2	3707.2	847	1777.2	1872.2	3554.4	3744.4
567	1721.2	1816.2	3442.4	3632.4	661	1740.0	1835.0	3480.0	3670.0	755	1758.8	1853.8	3517.6	3707.6	848	1777.4	1872.4	3554.8	3744.8
568	1721.4	1816.4	3442.8	3632.8	662	1740.2	1835.2	3480.4	3670.4	756	1759.0	1854.0	3518.0	3708.0	849	1777.6	1872.6	3555.2	3745.2
569	1721.6	1816.6	3443.2	3633.2	663	1740.4	1835.4	3480.8	3670.8	757	1759.2	1854.2	3518.4	3708.4	850	1777.8	1872.8	3555.6	3745.6
570	1721.8	1816.8	3443.6	3633.6	664	1740.6	1835.6	3481.2	3671.2	758	1759.4	1854.4	3518.8	3708.8	851	1778.0	1873.0	3556.0	3746.0
571	1722.0	1817.0	3444.0	3634.0	665	1740.8	1835.8	3481.6	3671.6	759	1759.6	1854.6	3519.2	3709.2	852	1778.2	1873.2	3556.4	3746.4
572	1722.2	1817.2	3444.4	3634.4	666	1741.0	1836.0	3482.0	3672.0	760	1759.8	1854.8	3519.6	3709.6	853	1778.4	1873.4	3556.8	3746.8
573	1722.4	1817.4	3444.8	3634.8	667	1741.2	1836.2	3482.4	3672.4	761	1760.0	1855.0	3520.0	3710.0	854	1778.6	1873.6	3557.2	3747.2
574	1722.6	1817.6	3445.2	3635.2	668	1741.4	1836.4	3482.8	3672.8	762	1760.2	1855.2	3520.4	3710.4	855	1778.8	1873.8	3557.6	3747.6
575	1722.8	1817.8	3445.6	3635.6	669	1741.6	1836.6	3483.2	3673.2	763	1760.4	1855.4	3520.8	3710.8	856	1779.0	1874.0	3558.0	3748.0
576	1723.0	1818.0	3446.0	3636.0	670	1741.8	1836.8	3483.6	3673.6	764	1760.6	1855.6	3521.2	3711.2	857	1779.2	1874.2	3558.4	3748.4
577	1723.2	1818.2	3446.4	3636.4	671	1742.0	1837.0	3484.0	3674.0	765	1760.8	1855.8	3521.6	3711.6	858	1779.4	1874.4	3558.8	3748.8
578	1723.4	1818.4	3446.8	3636.8	672	1742.2	1837.2	3484.4	3674.4	766	1761.0	1856.0	3522.0	3712.0	859	1779.6	1874.6	3559.2	3749.2
579	1723.6	1818.6	3447.2	3637.2	673	1742.4	1837.4	3484.8	3674.8	767	1761.2	1856.2	3522.4	3712.4	860	1779.8	1874.8	3559.6	3749.6
580	1723.8	1818.8	3447.6	3637.6	674	1742.6	1837.6	3485.2	3675.2	768	1761.4	1856.4	3522.8	3712.8	861	1780.0	1875.0	3560.0	3750.0
581	1724.0	1819.0	3448.0	3638.0	675	1742.8	1837.8	3485.6	3675.6	769	1761.6	1856.6	3523.2	3713.2	862	1780.2	1875.2	3560.4	3750.4
582	1724.2	1819.2	3448.4	3638.4	676	1743.0	1838.0	3486.0	3676.0	770	1761.8	1856.8	3523.6	3713.6	863	1780.4	1875.4	3560.8	3750.8
583	1724.4	1819.4	3448.8	3638.8	677	1743.2	1838.2	3486.4	3676.4	771	1762.0	1857.0	3524.0	3714.0	864	1780.6	1875.6	3561.2	3751.2
584	1724.6	1819.6	3449.2	3639.2	678	1743.4	1838.4	3486.8	3676.8	772	1762.2	1857.2	3524.4	3714.4	865	1780.8	1875.8	3561.6	3751.6
585	1724.8	1819.8	3449.6	3639.6	679	1743.6	1838.6	3487.2	3677.2	773	1762.4	1857.4	3524.8	3714.8	866	1781.0	1876.0	3562.0	3752.0
586	1725.0	1820.0	3450.0	3640.0	680	1743.8	1838.8	3487.6	3677.6	774	1762.6	1857.6	3525.2	3715.2	867	1781.2	1876.2	3562.4	3752.4
587	1725.2	1820.2	3450.4	3640.4	681	1744.0	1839.0	3488.0	3678.0	775	1762.8	1857.8	3525.6	3715.6	868	1781.4	1876.4	3562.8	3752.8
588	1725.4	1820.4	3450.8	3640.8	682	1744.2	1839.2	3488.4	3678.4	776	1763.0	1858.0	3526.0	3716.0	869	1781.6	1876.6	3563.2	3753.2
589	1725.6	1820.6	3451.2	3641.2	683	1744.4	1839.4	3488.8	3678.8	777	1763.2	1858.2	3526.4	3716.4	870	1781.8	1876.8	3563.6	3753.6
590	1725.8	1820.8	3451.6	3641.6	684	1744.6	1839.6	3489.2	3679.2	778	1763.4	1858.4	3526.8	3716.8	871	1782.0	1877.0	3564.0	3754.0
591	1726.0	1821.0	3452.0	3642.0	685	1744.8	1839.8	3489.6	3679.6	779	1763.6	1858.6	3527.2	3717.2	872	1782.2	1877.2	3564.4	3754.4
592	1726.2	1821.2	3452.4	3642.4	686	1745.0	1840.0	3490.0	3680.0	780	1763.8	1858.8	3527.6	3717.6	873	1782.4	1877.4	3564.8	3754.8
593	1726.4	1821.4	3452.8	3642.8	687	1745.2	1840.2	3490.4	3680.4	781	1764.0	1859.0	3528.0	3718.0	874	1782.6	1877.6	3565.2	3755.2
594	1726.6	1821.6	3453.2	3643.2	688	1745.4	1840.4	3490.8	3680.8	782	1764.2	1859.2	3528.4	3718.4	875	1782.8	1877.8	3565.6	3755.6
595	1726.8	1821.8	3453.6	3643.6	689	1745.6	1840.6	3491.2	3681.2	783	1764.4	1859.4	3528.8	3718.8	876	1783.0	1878.0	3566.0	3756.0
596	1727.0	1822.0	3454.0	3644.0	690	1745.8	1840.8	3491.6	3681.6	784	1764.6	1859.6	3529.2	3719.2	877	1783.2	1878.2	3566.4	3756.4
597	1727.2	1822.2	3454.4	3644.4	691	1746.0	1841.0	3492.0	3682.0	785	1764.8	1859.8	3529.6	3719.6	878	1783.4	1878.4	3566.8	3756.8
598	1727.4	1822.4	3454.8	3644.8	692	1746.2	1841.2	3492.4	3682.4	786	1765.0	1860.0	3530.0	3720.0	879	1783.6	1878.6	3567.2	3757.2
599	1727.6	1822.6	3455.2	3645.2	693	1746.4	1841.4	3492.8	3682.8	787	1765.2	1860.2	3530.4	3720.4	880	1783.8	1878.8	3567.6	3757.6
600	1727.8	1822.8	3455.6	3645.6	694	1746.6	1841.6	3493.2	3683.2	788	1765.4	1860.4	3530.8	3720.8	881	1784.0	1879.0	3568.0	3758.0
601	1728.0	1823.0	3456.0	3646.0	695	1746.8	1841.8	3493.6	3683.6	789	1765.6	1860.6	3531.2	3721.2	882	1784.2	1879.2	3568.4	3758.4
602	1728.2	1823.2	3456.4	3646.4	696	1747.0	1842.0	3494.0	3684.0	790	1765.8	1860.8	3531.6	3721.6	883	1784.4	1879.4	3568.8	3758.8
603	1728.4	1823.4	3456.8	3646.8	697	1747.2	1842.2	3494.4	3684.4	791	1766.0	1861.0	3532.0	3722.0	884	1784.6	1879.6	3569.2	3759.2
604	1728.6	1823.6	3457.2	3647.2	698	1747.4	1842.4	3494.8	3684.8	792	1766.2	1861.2	3532.4	3722.4	885	1784.8	1879.8	3569.6	3759.6
605	1728.8	1823.8	3457.6	3647.6	699	1747.6	1842.6	3495.2	3685.2										

GSM1900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
512	1850,2	1930,2	3700,4	3860,4	606	1869,0	1949,0	3738,0	3898,0	700	1887,8	1967,8	3775,6	3935,6	794	1906,6	1986,6	3813,2	3973,2
513	1850,4	1930,4	3700,8	3860,8	607	1869,2	1949,2	3738,4	3898,4	701	1888,0	1968,0	3776,0	3936,0	795	1906,8	1986,8	3813,6	3973,6
514	1850,6	1930,6	3701,2	3861,2	608	1869,4	1949,4	3738,8	3898,8	702	1888,2	1968,2	3776,4	3936,4	796	1907,0	1987,0	3814,0	3974,0
515	1850,8	1930,8	3701,6	3861,6	609	1869,6	1949,6	3739,2	3899,2	703	1888,4	1968,4	3776,8	3936,8	797	1907,2	1987,2	3814,4	3974,4
516	1851,0	1931,0	3702,0	3862,0	610	1869,8	1949,8	3739,6	3899,6	704	1888,6	1968,6	3777,2	3937,2	798	1907,4	1987,4	3814,8	3974,8
517	1851,2	1931,2	3702,4	3862,4	611	1870,0	1950,0	3740,0	3900,0	705	1888,8	1968,8	3777,6	3937,6	799	1907,6	1987,6	3815,2	3975,2
518	1851,4	1931,4	3702,8	3862,8	612	1870,2	1950,2	3740,4	3900,4	706	1889,0	1969,0	3778,0	3938,0	800	1907,8	1987,8	3815,6	3975,6
519	1851,6	1931,6	3703,2	3863,2	613	1870,4	1950,4	3740,8	3900,8	707	1889,2	1969,2	3778,4	3938,4	801	1908,0	1988,0	3816,0	3976,0
520	1851,8	1931,8	3703,6	3863,6	614	1870,6	1950,6	3741,2	3901,2	708	1889,4	1969,4	3778,8	3938,8	802	1908,2	1988,2	3816,4	3976,4
521	1852,0	1932,0	3704,0	3864,0	615	1870,8	1950,8	3741,6	3901,6	709	1889,6	1969,6	3779,2	3939,2	803	1908,4	1988,4	3816,8	3976,8
522	1852,2	1932,2	3704,4	3864,4	616	1871,0	1951,0	3742,0	3902,0	710	1889,8	1969,8	3779,6	3939,6	804	1908,6	1988,6	3817,2	3977,2
523	1852,4	1932,4	3704,8	3864,8	617	1871,2	1951,2	3742,4	3902,4	711	1890,0	1970,0	3780,0	3940,0	805	1908,8	1988,8	3817,6	3977,6
524	1852,6	1932,6	3705,2	3865,2	618	1871,4	1951,4	3742,8	3902,8	712	1890,2	1970,2	3780,4	3940,4	806	1909,0	1989,0	3818,0	3978,0
525	1852,8	1932,8	3705,6	3865,6	619	1871,6	1951,6	3743,2	3903,2	713	1890,4	1970,4	3780,8	3940,8	807	1909,2	1989,2	3818,4	3978,4
526	1853,0	1933,0	3706,0	3866,0	620	1871,8	1951,8	3743,6	3903,6	714	1890,6	1970,6	3781,2	3941,2	808	1909,4	1989,4	3818,8	3978,8
527	1853,2	1933,2	3706,4	3866,4	621	1872,0	1952,0	3744,0	3904,0	715	1890,8	1970,8	3781,6	3941,6	809	1909,6	1989,6	3819,2	3979,2
528	1853,4	1933,4	3706,8	3866,8	622	1872,2	1952,2	3744,4	3904,4	716	1891,0	1971,0	3782,0	3942,0	810	1909,8	1989,8	3819,6	3979,6
529	1853,6	1933,6	3707,2	3867,2	623	1872,4	1952,4	3744,8	3904,8	717	1891,2	1971,2	3782,4	3942,4					
530	1853,8	1933,8	3707,6	3867,6	624	1872,6	1952,6	3745,2	3905,2	718	1891,4	1971,4	3782,8	3942,8					
531	1854,0	1934,0	3708,0	3868,0	625	1872,8	1952,8	3745,6	3905,6	719	1891,6	1971,6	3783,2	3943,2					
532	1854,2	1934,2	3708,4	3868,4	626	1873,0	1953,0	3746,0	3906,0	720	1891,8	1971,8	3783,6	3943,6					
533	1854,4	1934,4	3708,8	3868,8	627	1873,2	1953,2	3746,4	3906,4	721	1892,0	1972,0	3784,0	3944,0					
534	1854,6	1934,6	3709,2	3869,2	628	1873,4	1953,4	3746,8	3906,8	722	1892,2	1972,2	3784,4	3944,4					
535	1854,8	1934,8	3709,6	3869,6	629	1873,6	1953,6	3747,2	3907,2	723	1892,4	1972,4	3784,8	3944,8					
536	1855,0	1935,0	3710,0	3870,0	630	1873,8	1953,8	3747,6	3907,6	724	1892,6	1972,6	3785,2	3945,2					
537	1855,2	1935,2	3710,4	3870,4	631	1874,0	1954,0	3748,0	3908,0	725	1892,8	1972,8	3785,6	3945,6					
538	1855,4	1935,4	3710,8	3870,8	632	1874,2	1954,2	3748,4	3908,4	726	1893,0	1973,0	3786,0	3946,0					
539	1855,6	1935,6	3711,2	3871,2	633	1874,4	1954,4	3748,8	3908,8	727	1893,2	1973,2	3786,4	3946,4					
540	1855,8	1935,8	3711,6	3871,6	634	1874,6	1954,6	3749,2	3909,2	728	1893,4	1973,4	3786,8	3946,8					
541	1856,0	1936,0	3712,0	3872,0	635	1874,8	1954,8	3749,6	3909,6	729	1893,6	1973,6	3787,2	3947,2					
542	1856,2	1936,2	3712,4	3872,4	636	1875,0	1955,0	3750,0	3910,0	730	1893,8	1973,8	3787,6	3947,6					
543	1856,4	1936,4	3712,8	3872,8	637	1875,2	1955,2	3750,4	3910,4	731	1894,0	1974,0	3788,0	3948,0					
544	1856,6	1936,6	3713,2	3873,2	638	1875,4	1955,4	3750,8	3910,8	732	1894,2	1974,2	3788,4	3948,4					
545	1856,8	1936,8	3713,6	3873,6	639	1875,6	1955,6	3751,2	3911,2	733	1894,4	1974,4	3788,8	3948,8					
546	1857,0	1937,0	3714,0	3874,0	640	1875,8	1955,8	3751,6	3911,6	734	1894,6	1974,6	3789,2	3949,2					
547	1857,2	1937,2	3714,4	3874,4	641	1876,0	1956,0	3752,0	3912,0	735	1894,8	1974,8	3789,6	3949,6					
548	1857,4	1937,4	3714,8	3874,8	642	1876,2	1956,2	3752,4	3912,4	736	1895,0	1975,0	3790,0	3950,0					
549	1857,6	1937,6	3715,2	3875,2	643	1876,4	1956,4	3752,8	3912,8	737	1895,2	1975,2	3790,4	3950,4					
550	1857,8	1937,8	3715,6	3875,6	644	1876,6	1956,6	3753,2	3913,2	738	1895,4	1975,4	3790,8	3950,8					
551	1858,0	1938,0	3716,0	3876,0	645	1876,8	1956,8	3753,6	3913,6	739	1895,6	1975,6	3791,2	3951,2					
552	1858,2	1938,2	3716,4	3876,4	646	1877,0	1957,0	3754,0	3914,0	740	1895,8	1975,8	3791,6	3951,6					
553	1858,4	1938,4	3716,8	3876,8	647	1877,2	1957,2	3754,4	3914,4	741	1896,0	1976,0	3792,0	3952,0					
554	1858,6	1938,6	3717,2	3877,2	648	1877,4	1957,4	3754,8	3914,8	742	1896,2	1976,2	3792,4	3952,4					
555	1858,8	1938,8	3717,6	3877,6	649	1877,6	1957,6	3755,2	3915,2	743	1896,4	1976,4	3792,8	3952,8					
556	1859,0	1939,0	3718,0	3878,0	650	1877,8	1957,8	3755,6	3915,6	744	1896,6	1976,6	3793,2	3953,2					
557	1859,2	1939,2	3718,4	3878,4	651	1878,0	1958,0	3756,0	3916,0	745	1896,8	1976,8	3793,6	3953,6					
558	1859,4	1939,4	3718,8	3878,8	652	1878,2	1958,2	3756,4	3916,4	746	1897,0	1977,0	3794,0	3954,0					
559	1859,6	1939,6	3719,2	3879,2	653	1878,4	1958,4	3756,8	3916,8	747	1897,2	1977,2	3794,4	3954,4					
560	1859,8	1939,8	3719,6	3879,6	654	1878,6	1958,6	3757,2	3917,2	748	1897,4	1977,4	3794,8	3954,8					
561	1860,0	1940,0	3720,0	3880,0	655	1878,8	1958,8	3757,6	3917,6	749	1897,6	1977,6	3795,2	3955,2					
562	1860,2	1940,2	3720,4	3880,4	656	1879,0	1959,0	3758,0	3918,0	750	1897,8	1977,8	3795,6	3955,6					
563	1860,4	1940,4	3720,8	3880,8	657	1879,2	1959,2	3758,4	3918,4	751	1898,0	1978,0	3796,0	3956,0					
564	1860,6	1940,6	3721,2	3881,2	658	1879,4	1959,4	3758,8	3918,8	752	1898,2	1978,2	3796,4	3956,4					
565	1860,8	1940,8	3721,6	3881,6	659	1879,6	1959,6	3759,2	3919,2	753	1898,4	1978,4	3796,8	3956,8					
566	1861,0	1941,0	3722,0	3882,0	660	1879,8	1959,8	3759,6	3919,6	754	1898,6	1978,6	3797,2	3957,2					
567	1861,2	1941,2	3722,4	3882,4	661	1880,0	1960,0	3760,0	3920,0	755	1898,8	1978,8	3797,6	3957,6					
568	1861,4	1941,4	3722,8	3882,8	662	1880,2	1960,2	3760,4	3920,4	756	1899,0	1979,0	3798,0	3958,0					
569	1861,6	1941,6	3723,2	3883,2	663	1880,4	1960,4	3760,8	3920,8	757	1899,2	1979,2	3798,4	3958,4					
570	1861,8	1941,8	3723,6	3883,6	664	1880,6	1960,6	3761,2	3921,2	758	1899,4	1979,4	3798,8	3958,8					
571	1862,0	1942,0	3724,0	3884,0	665	1880,8	1960,8	3761,6	3921,6	759	1899,6	1979,6	3799,2	3959,2					
572	1862,2	1942,2	3724,4	3884,4	666	1881,0	1961,0	3762,0	3922,0	760	1899,8	1979,8	3799,6	3959,6					
573	1862,4	1942,4	3724,8	3884,8	667	1881,2	1961,2	3762,4	3922,4	761	1900,0	1980,0	3800,0	3960,0					
574	1862,6	1942,6	3725,2	3885,2	668	1881,4	1961,4	3762,8	3922,8	762	1900,2	1980,2	3800,4	3960,4					
575	1862,8	1942,8	3725,6	3885,6	669	1881,6	1961,6	3763,2	3923,2	763	1900,4	1980,4	3800,8	3960,8					
576	1863,0	1943,0	3726,0	3886,0	670	1881,8	1961,8	3763,6	3923,6	764	1900,6	1980,6	3801,2	3961,2					
577	1863,2	1943,2	3726,4	3886,4	671	1882,0	1962,0	3764,0	3924,0	765	1900,8	1980,8	3801,6	3961,6					
578	1863,4	1943,4	3726,8	3886,8	672	1882,2	1962,2	3764,4	3924,4	766	1901,0	1981,0	3802,0	3962,0					
579	1863,6	1943,6	3727,2	3887,2	673	1882,4	1962,4	3764,8	3924,8	767	1901,2	1981,2	3802,4	3962,4					
580	1863,8	1943,8	3727,6	3887,6	674	1882,6	1962,6	3765,2	3925,2	768	1901,4	1981,4	3802,8	3962,8					
581	1864,0	1944,0	3728,0	3888,0	675	1882,8	1962,8	3765,6	3925,6	769	1901,6	1981,6	3803,2	3963,2					
582	1864,2	1944,2	3728,4	3888,4	676	1883,0	1963,0	3766,0	3926,0	770	1901,8	1981,8	3803,6	3963,6					
583	1864,4	1944,4	3728,8	3888,8	677	1883,2	1963,2	3766,4	3926,4	771	1902,0	1982,0	3804,0	3964,0					
584	1864,6	1944,6	3729,2	3889,2	678	1883,4	1963,4	3766,8	3926,8	772	1902,2	1982,2	3804,4	3964,4					
585	1864,8	1944,8	3729,6	3889,6	679	1883,6	1963,6	3767,2	3927,2	773	1902,4	1982,4	3804,8	3964,8					
586	1865,0	1945,0	3730,0	3890,0	680	1883,8	1963,8	3767,6	3927,6	774	1902,6	1982,6	3805,2	3965,2					
587	1865,2	1945,2	3730,4	3890,4	681	1884,0	1964,0	3768,0	3928,0	775	1902,8	1982,8	3805,6	3965,6					
588	1865,4	1945,4	3730,8	3890,8	682	1884,2	1964,2	3768,4	3928,4	776	1903,0	1983,0	3806,0	3966,0					
589	1865,6	1945,6	3731,2	3891,2	683	1884,4	1964,4	3768,8	3928,8	777	1903,2	1983,2	3806,4	3966,4					
590	1865,8	1945,8	3731,6	3891,6	684	1884,6	1964,6	3769,2	3929,2	778	1903,4	1983,4	3806,8	3966,8					
591	1866,0	1946,0	3732,0	3892,0	685	1884,8	1964,8	3769,6	3929,6	779	1903,6	1983,6	3807,2	3967,2					
592	1866,2	1946,2	3732,4	3892,4	686	1885,0	1965,0	3770,0	3930,0	780	1903,8	1983,8	3807,6	3967,6					
593	1866,4	1946,4	3732,8	3892,8	687	1885,2	1965,2	3770,4	3930,4	781	1904,0	1984,0	3808,0	3968,0					
594	1866,6	1946,6	3733,2	3893,2	688	1885,4	1965,4	3770,8	3930,8	782	1904,2	1984,2	3808,4	3968,4					
595	1866,8	1946,8	3733,6	3893,6	689	1885,6	1965,6	3771,2	3931,2	783	1904,4	1984,4	3808,8	3968,8					
596	1867,0	1947,0	3734,0	3894,0	690	1885,8	1965,8	3771,6	3931,6	784	1904,6	1984,6	3809,2	3969,2					
597	1867,2	1947,2	3734,4	3894,4	691	1886,0	1966,0	3772,0	3932,0	785	1904,8	1984,8	3809,6	3969,6					
598	1867,4	1947,4	3734,8	3894,8	692	1886,2	1966,2	3772,4	3932,4	786	1905,0	1985,0	3810,0	3970,0					
599	1867,6	1947,6	3735,2	3895,2	693	1886,4	1966,4	3772,8	3932,8	787	1905,2	1985,2	3810,4	3970,4					
600	1867,8	1947,8	3735,6	3895,6	694	1886,6	1966,6	3773,2	3933,2	788	1905,4	1985,4	3810,8	3970,8					
601	1868,0	1948,0	3736,0	3896,0	695	1886,8	1966,8	3773,6	3933,6	789	1905,6	1985,6	3811,2	3971,2					
602	1868,2	1948,2	3736,4	3896,4	696	1887,0	1967,0	3774,0	3934,0	790	1905,8	1985,8	3811,6	3971,6					
603	1868,4	1948,4	3736,8	3896,8	697	1887,2	1967,2	3774,4	3934,4	791	1906,0	1986,0	3812,0	3972,0					
604	1868,6	1948,6	3737,2	3897,2	698	1887,4	1967,4	3774,8	3934,8	792	1906,2	1986,2	3812,4	3972,4					
605	1868,8	1948,8	3737,6	3897,6	699	1887,6	1967,6	3775,2	3935,2	793	1906,4	1986,4	3812,8	3972,8					

WCDMA 2100 Rx frequencies

Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX
10562	2112.4	4224.8	10625	2125	4250	10688	2137.6	4275.2	10751	2150.2	4300.4	10814	2162.8	4325.6
10563	2112.6	4225.2	10626	2125.2	4250.4	10689	2137.8	4275.6	10752	2150.4	4300.8	10815	2163	4326
10564	2112.8	4225.6	10627	2125.4	4250.8	10690	2138	4276	10753	2150.6	4301.2	10816	2163.2	4326.4
10565	2113	4226	10628	2125.6	4251.2	10691	2138.2	4276.4	10754	2150.8	4301.6	10817	2163.4	4326.8
10566	2113.2	4226.4	10629	2125.8	4251.6	10692	2138.4	4276.8	10755	2151	4302	10818	2163.6	4327.2
10567	2113.4	4226.8	10630	2126	4252	10693	2138.6	4277.2	10756	2151.2	4302.4	10819	2163.8	4327.6
10568	2113.6	4227.2	10631	2126.2	4252.4	10694	2138.8	4277.6	10757	2151.4	4302.8	10820	2164	4328
10569	2113.8	4227.6	10632	2126.4	4252.8	10695	2139	4278	10758	2151.6	4303.2	10821	2164.2	4328.4
10570	2114	4228	10633	2126.6	4253.2	10696	2139.2	4278.4	10759	2151.8	4303.6	10822	2164.4	4328.8
10571	2114.2	4228.4	10634	2126.8	4253.6	10697	2139.4	4278.8	10760	2152	4304	10823	2164.6	4329.2
10572	2114.4	4228.8	10635	2127	4254	10698	2139.6	4279.2	10761	2152.2	4304.4	10824	2164.8	4329.6
10573	2114.6	4229.2	10636	2127.2	4254.4	10699	2139.8	4279.6	10762	2152.4	4304.8	10825	2165	4330
10574	2114.8	4229.6	10637	2127.4	4254.8	10700	2140	4280	10763	2152.6	4305.2	10826	2165.2	4330.4
10575	2115	4230	10638	2127.6	4255.2	10701	2140.2	4280.4	10764	2152.8	4305.6	10827	2165.4	4330.8
10576	2115.2	4230.4	10639	2127.8	4255.6	10702	2140.4	4280.8	10765	2153	4306	10828	2165.6	4331.2
10577	2115.4	4230.8	10640	2128	4256	10703	2140.6	4281.2	10766	2153.2	4306.4	10829	2165.8	4331.6
10578	2115.6	4231.2	10641	2128.2	4256.4	10704	2140.8	4281.6	10767	2153.4	4306.8	10830	2166	4332
10579	2115.8	4231.6	10642	2128.4	4256.8	10705	2141	4282	10768	2153.6	4307.2	10831	2166.2	4332.4
10580	2116	4232	10643	2128.6	4257.2	10706	2141.2	4282.4	10769	2153.8	4307.6	10832	2166.4	4332.8
10581	2116.2	4232.4	10644	2128.8	4257.6	10707	2141.4	4282.8	10770	2154	4308	10833	2166.6	4333.2
10582	2116.4	4232.8	10645	2129	4258	10708	2141.6	4283.2	10771	2154.2	4308.4	10834	2166.8	4333.6
10583	2116.6	4233.2	10646	2129.2	4258.4	10709	2141.8	4283.6	10772	2154.4	4308.8	10835	2167	4334
10584	2116.8	4233.6	10647	2129.4	4258.8	10710	2142	4284	10773	2154.6	4309.2	10836	2167.2	4334.4
10585	2117	4234	10648	2129.6	4259.2	10711	2142.2	4284.4	10774	2154.8	4309.6	10837	2167.4	4334.8
10586	2117.2	4234.4	10649	2129.8	4259.6	10712	2142.4	4284.8	10775	2155	4310	10838	2167.6	4335.2
10587	2117.4	4234.8	10650	2130	4260	10713	2142.6	4285.2	10776	2155.2	4310.4			
10588	2117.6	4235.2	10651	2130.2	4260.4	10714	2142.8	4285.6	10777	2155.4	4310.8			
10589	2117.8	4235.6	10652	2130.4	4260.8	10715	2143	4286	10778	2155.6	4311.2			
10590	2118	4236	10653	2130.6	4261.2	10716	2143.2	4286.4	10779	2155.8	4311.6			
10591	2118.2	4236.4	10654	2130.8	4261.6	10717	2143.4	4286.8	10780	2156	4312			
10592	2118.4	4236.8	10655	2131	4262	10718	2143.6	4287.2	10781	2156.2	4312.4			
10593	2118.6	4237.2	10656	2131.2	4262.4	10719	2143.8	4287.6	10782	2156.4	4312.8			
10594	2118.8	4237.6	10657	2131.4	4262.8	10720	2144	4288	10783	2156.6	4313.2			
10595	2119	4238	10658	2131.6	4263.2	10721	2144.2	4288.4	10784	2156.8	4313.6			
10596	2119.2	4238.4	10659	2131.8	4263.6	10722	2144.4	4288.8	10785	2157	4314			
10597	2119.4	4238.8	10660	2132	4264	10723	2144.6	4289.2	10786	2157.2	4314.4			
10598	2119.6	4239.2	10661	2132.2	4264.4	10724	2144.8	4289.6	10787	2157.4	4314.8			
10599	2119.8	4239.6	10662	2132.4	4264.8	10725	2145	4290	10788	2157.6	4315.2			
10600	2120	4240	10663	2132.6	4265.2	10726	2145.2	4290.4	10789	2157.8	4315.6			
10601	2120.2	4240.4	10664	2132.8	4265.6	10727	2145.4	4290.8	10790	2158	4316			
10602	2120.4	4240.8	10665	2133	4266	10728	2145.6	4291.2	10791	2158.2	4316.4			
10603	2120.6	4241.2	10666	2133.2	4266.4	10729	2145.8	4291.6	10792	2158.4	4316.8			
10604	2120.8	4241.6	10667	2133.4	4266.8	10730	2146	4292	10793	2158.6	4317.2			
10605	2121	4242	10668	2133.6	4267.2	10731	2146.2	4292.4	10794	2158.8	4317.6			
10606	2121.2	4242.4	10669	2133.8	4267.6	10732	2146.4	4292.8	10795	2159	4318			
10607	2121.4	4242.8	10670	2134	4268	10733	2146.6	4293.2	10796	2159.2	4318.4			
10608	2121.6	4243.2	10671	2134.2	4268.4	10734	2146.8	4293.6	10797	2159.4	4318.8			
10609	2121.8	4243.6	10672	2134.4	4268.8	10735	2147	4294	10798	2159.6	4319.2			
10610	2122	4244	10673	2134.6	4269.2	10736	2147.2	4294.4	10799	2159.8	4319.6			
10611	2122.2	4244.4	10674	2134.8	4269.6	10737	2147.4	4294.8	10800	2160	4320			
10612	2122.4	4244.8	10675	2135	4270	10738	2147.6	4295.2	10801	2160.2	4320.4			
10613	2122.6	4245.2	10676	2135.2	4270.4	10739	2147.8	4295.6	10802	2160.4	4320.8			
10614	2122.8	4245.6	10677	2135.4	4270.8	10740	2148	4296	10803	2160.6	4321.2			
10615	2123	4246	10678	2135.6	4271.2	10741	2148.2	4296.4	10804	2160.8	4321.6			
10616	2123.2	4246.4	10679	2135.8	4271.6	10742	2148.4	4296.8	10805	2161	4322			
10617	2123.4	4246.8	10680	2136	4272	10743	2148.6	4297.2	10806	2161.2	4322.4			
10618	2123.6	4247.2	10681	2136.2	4272.4	10744	2148.8	4297.6	10807	2161.4	4322.8			
10619	2123.8	4247.6	10682	2136.4	4272.8	10745	2149	4298	10808	2161.6	4323.2			
10620	2124	4248	10683	2136.6	4273.2	10746	2149.2	4298.4	10809	2161.8	4323.6			
10621	2124.2	4248.4	10684	2136.8	4273.6	10747	2149.4	4298.8	10810	2162	4324			
10622	2124.4	4248.8	10685	2137	4274	10748	2149.6	4299.2	10811	2162.2	4324.4			
10623	2124.6	4249.2	10686	2137.2	4274.4	10749	2149.8	4299.6	10812	2162.4	4324.8			
10624	2124.8	4249.6	10687	2137.4	4274.8	10750	2150	4300	10813	2162.6	4325.2			

WCDMA 2100 Tx frequencies

Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx
9612	1922.4	3844.8	9671	1934.2	3868.4	9730	1946	3892	9789	1957.8	3915.6	9848	1969.6	3939.2
9613	1922.6	3845.2	9672	1934.4	3868.8	9731	1946.2	3892.4	9790	1958	3916	9849	1969.8	3939.6
9614	1922.8	3845.6	9673	1934.6	3869.2	9732	1946.4	3892.8	9791	1958.2	3916.4	9850	1970	3940
9615	1923	3846	9674	1934.8	3869.6	9733	1946.6	3893.2	9792	1958.4	3916.8	9851	1970.2	3940.4
9616	1923.2	3846.4	9675	1935	3870	9734	1946.8	3893.6	9793	1958.6	3917.2	9852	1970.4	3940.8
9617	1923.4	3846.8	9676	1935.2	3870.4	9735	1947	3894	9794	1958.8	3917.6	9853	1970.6	3941.2
9618	1923.6	3847.2	9677	1935.4	3870.8	9736	1947.2	3894.4	9795	1959	3918	9854	1970.8	3941.6
9619	1923.8	3847.6	9678	1935.6	3871.2	9737	1947.4	3894.8	9796	1959.2	3918.4	9855	1971	3942
9620	1924	3848	9679	1935.8	3871.6	9738	1947.6	3895.2	9797	1959.4	3918.8	9856	1971.2	3942.4
9621	1924.2	3848.4	9680	1936	3872	9739	1947.8	3895.6	9798	1959.6	3919.2	9857	1971.4	3942.8
9622	1924.4	3848.8	9681	1936.2	3872.4	9740	1948	3896	9799	1959.8	3919.6	9858	1971.6	3943.2
9623	1924.6	3849.2	9682	1936.4	3872.8	9741	1948.2	3896.4	9800	1960	3920	9859	1971.8	3943.6
9624	1924.8	3849.6	9683	1936.6	3873.2	9742	1948.4	3896.8	9801	1960.2	3920.4	9860	1972	3944
9625	1925	3850	9684	1936.8	3873.6	9743	1948.6	3897.2	9802	1960.4	3920.8	9861	1972.2	3944.4
9626	1925.2	3850.4	9685	1937	3874	9744	1948.8	3897.6	9803	1960.6	3921.2	9862	1972.4	3944.8
9627	1925.4	3850.8	9686	1937.2	3874.4	9745	1949	3898	9804	1960.8	3921.6	9863	1972.6	3945.2
9628	1925.6	3851.2	9687	1937.4	3874.8	9746	1949.2	3898.4	9805	1961	3922	9864	1972.8	3945.6
9629	1925.8	3851.6	9688	1937.6	3875.2	9747	1949.4	3898.8	9806	1961.2	3922.4	9865	1973	3946
9630	1926	3852	9689	1937.8	3875.6	9748	1949.6	3899.2	9807	1961.4	3922.8	9866	1973.2	3946.4
9631	1926.2	3852.4	9690	1938	3876	9749	1949.8	3899.6	9808	1961.6	3923.2	9867	1973.4	3946.8
9632	1926.4	3852.8	9691	1938.2	3876.4	9750	1950	3900	9809	1961.8	3923.6	9868	1973.6	3947.2
9633	1926.6	3853.2	9692	1938.4	3876.8	9751	1950.2	3900.4	9810	1962	3924	9869	1973.8	3947.6
9634	1926.8	3853.6	9693	1938.6	3877.2	9752	1950.4	3900.8	9811	1962.2	3924.4	9870	1974	3948
9635	1927	3854	9694	1938.8	3877.6	9753	1950.6	3901.2	9812	1962.4	3924.8	9871	1974.2	3948.4
9636	1927.2	3854.4	9695	1939	3878	9754	1950.8	3901.6	9813	1962.6	3925.2	9872	1974.4	3948.8
9637	1927.4	3854.8	9696	1939.2	3878.4	9755	1951	3902	9814	1962.8	3925.6	9873	1974.6	3949.2
9638	1927.6	3855.2	9697	1939.4	3878.8	9756	1951.2	3902.4	9815	1963	3926	9874	1974.8	3949.6
9639	1927.8	3855.6	9698	1939.6	3879.2	9757	1951.4	3902.8	9816	1963.2	3926.4	9875	1975	3950
9640	1928	3856	9699	1939.8	3879.6	9758	1951.6	3903.2	9817	1963.4	3926.8	9876	1975.2	3950.4
9641	1928.2	3856.4	9700	1940	3880	9759	1951.8	3903.6	9818	1963.6	3927.2	9877	1975.4	3950.8
9642	1928.4	3856.8	9701	1940.2	3880.4	9760	1952	3904	9819	1963.8	3927.6	9878	1975.6	3951.2
9643	1928.6	3857.2	9702	1940.4	3880.8	9761	1952.2	3904.4	9820	1964	3928	9879	1975.8	3951.6
9644	1928.8	3857.6	9703	1940.6	3881.2	9762	1952.4	3904.8	9821	1964.2	3928.4	9880	1976	3952
9645	1929	3858	9704	1940.8	3881.6	9763	1952.6	3905.2	9822	1964.4	3928.8	9881	1976.2	3952.4
9646	1929.2	3858.4	9705	1941	3882	9764	1952.8	3905.6	9823	1964.6	3929.2	9882	1976.4	3952.8
9647	1929.4	3858.8	9706	1941.2	3882.4	9765	1953	3906	9824	1964.8	3929.6	9883	1976.6	3953.2
9648	1929.6	3859.2	9707	1941.4	3882.8	9766	1953.2	3906.4	9825	1965	3930	9884	1976.8	3953.6
9649	1929.8	3859.6	9708	1941.6	3883.2	9767	1953.4	3906.8	9826	1965.2	3930.4	9885	1977	3954
9650	1930	3860	9709	1941.8	3883.6	9768	1953.6	3907.2	9827	1965.4	3930.8	9886	1977.2	3954.4
9651	1930.2	3860.4	9710	1942	3884	9769	1953.8	3907.6	9828	1965.6	3931.2	9887	1977.4	3954.8
9652	1930.4	3860.8	9711	1942.2	3884.4	9770	1954	3908	9829	1965.8	3931.6	9888	1977.6	3955.2
9653	1930.6	3861.2	9712	1942.4	3884.8	9771	1954.2	3908.4	9830	1966	3932			
9654	1930.8	3861.6	9713	1942.6	3885.2	9772	1954.4	3908.8	9831	1966.2	3932.4			
9655	1931	3862	9714	1942.8	3885.6	9773	1954.6	3909.2	9832	1966.4	3932.8			
9656	1931.2	3862.4	9715	1943	3886	9774	1954.8	3909.6	9833	1966.6	3933.2			
9657	1931.4	3862.8	9716	1943.2	3886.4	9775	1955	3910	9834	1966.8	3933.6			
9658	1931.6	3863.2	9717	1943.4	3886.8	9776	1955.2	3910.4	9835	1967	3934			
9659	1931.8	3863.6	9718	1943.6	3887.2	9777	1955.4	3910.8	9836	1967.2	3934.4			
9660	1932	3864	9719	1943.8	3887.6	9778	1955.6	3911.2	9837	1967.4	3934.8			
9661	1932.2	3864.4	9720	1944	3888	9779	1955.8	3911.6	9838	1967.6	3935.2			
9662	1932.4	3864.8	9721	1944.2	3888.4	9780	1956	3912	9839	1967.8	3935.6			
9663	1932.6	3865.2	9722	1944.4	3888.8	9781	1956.2	3912.4	9840	1968	3936			
9664	1932.8	3865.6	9723	1944.6	3889.2	9782	1956.4	3912.8	9841	1968.2	3936.4			
9665	1933	3866	9724	1944.8	3889.6	9783	1956.6	3913.2	9842	1968.4	3936.8			
9666	1933.2	3866.4	9725	1945	3890	9784	1956.8	3913.6	9843	1968.6	3937.2			
9667	1933.4	3866.8	9726	1945.2	3890.4	9785	1957	3914	9844	1968.8	3937.6			
9668	1933.6	3867.2	9727	1945.4	3890.8	9786	1957.2	3914.4	9845	1969	3938			
9669	1933.8	3867.6	9728	1945.6	3891.2	9787	1957.4	3914.8	9846	1969.2	3938.4			
9670	1934	3868	9729	1945.8	3891.6	9788	1957.6	3915.2	9847	1969.4	3938.8			

10 — Schematics

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Table of Contents

System connector..10–4
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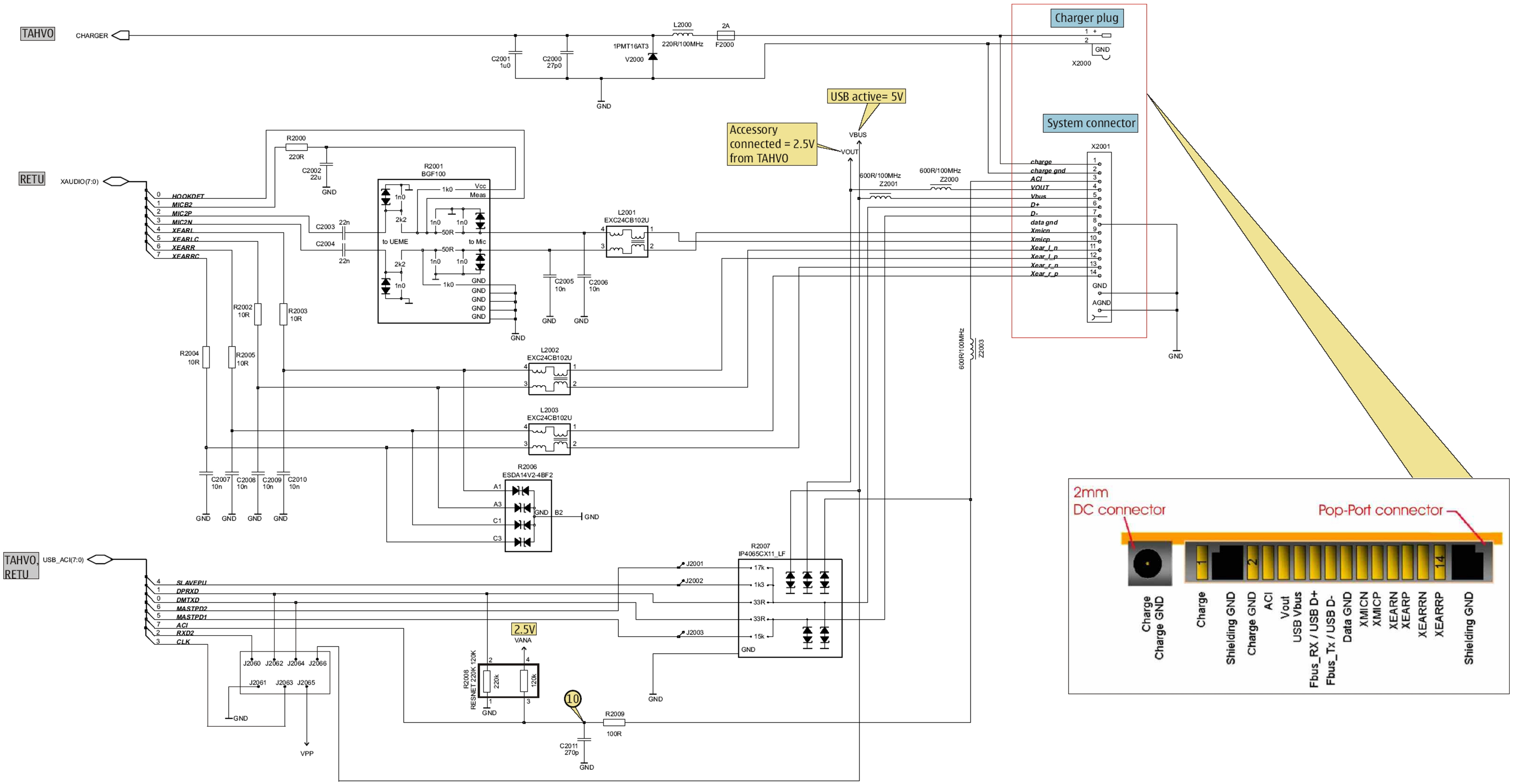
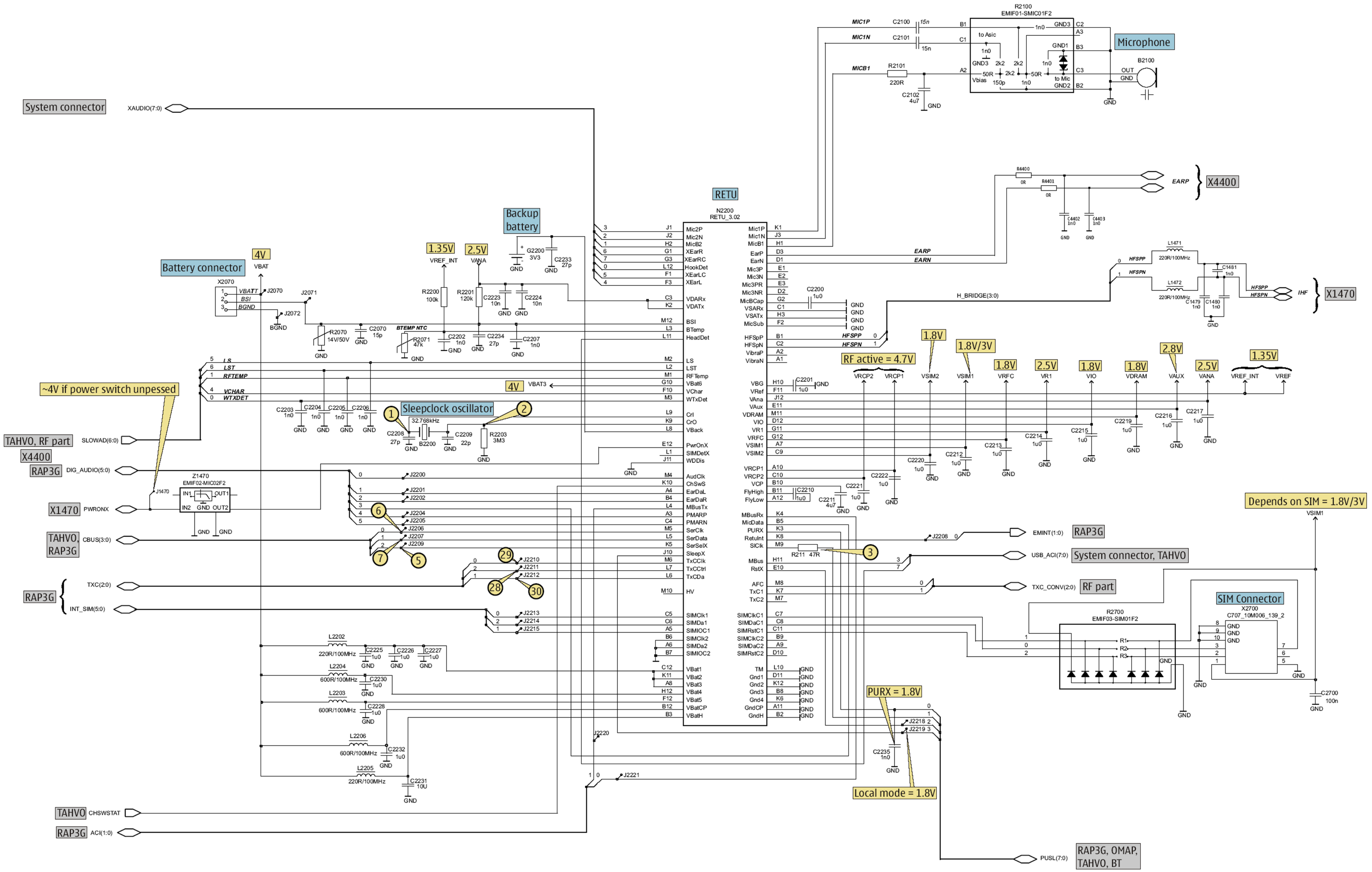
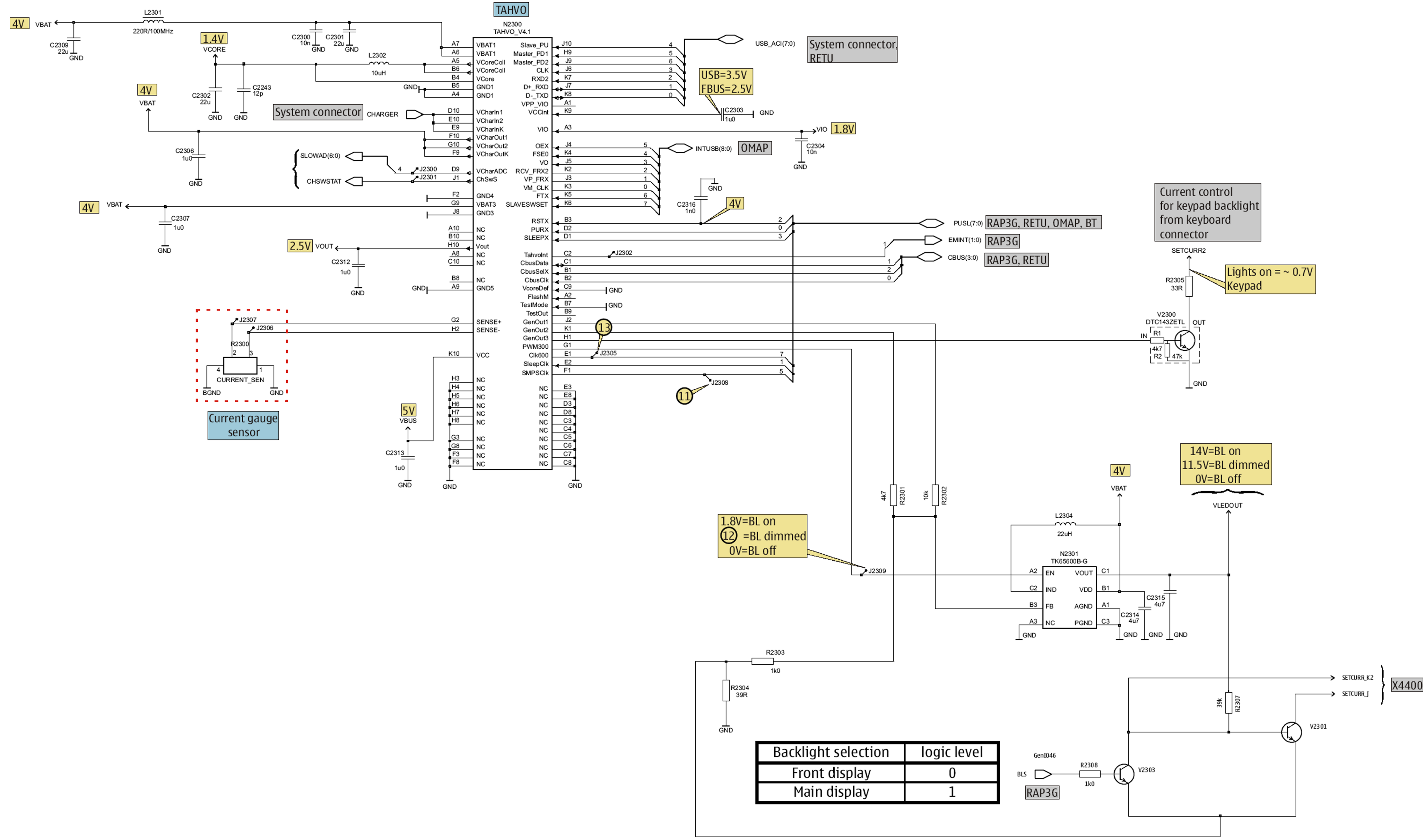
System connector


TAHVO
CHARGER
C2001 1u0
C2000 27p0
L2000 220R/100MHz
2A F2000
1PMT16AT3 V2000
GND
Charger plug
X2000
USB active= 5V
VBUS
VOUT
Accessory connected = 2.5V from TAHVO
System connector
X2001
charge
charge gnd
ACI
VOUT
Vbus
D+
D-
data gnd
Xmicn
Xmicp
Xear_l_n
Xear_l_p
Xear_r_n
Xear_r_p
AGND
600R/100MHz Z2001
600R/100MHz Z2000
600R/100MHz Z2003
RETU
XAUDIO(7:0)
HOOKDET
MICB2
MIC2P
MIC2N
XEARL
XEARLC
XEARR
XEARRC
R2000 220R
C2002 22u
R2001 BGF100
Vcc
Meas
1k0
1n0
2k2
50R
to UEME
to Mic
C2003 22n
C2004 22n
L2001 EXC24CB102U
C2005 10n
C2006 10n
R2002 10R
R2003 10R
R2004 10R
R2005 10R
L2002 EXC24CB102U
L2003 EXC24CB102U
R2006 ESDA14V2-4BF2
A1
A3
C1
C3
B2
C2007 10n
C2008 10n
C2009 10n
C2010 10n
TAHVO, RETU
USB_ACI(7:0)
SLAVEPU
DPRXD
DMTXD
MASTPD2
MASTPD1
ACI
RXD2
CLK
J2060
J2062
J2064
J2066
J2061
J2063
J2065
VPP
2.5V
VANA
R2008 RESNET 220K 120K
220k
120k
J2001
J2002
J2003
R2007 IP4065CX11_LF
17k
1k3
33R
15k
10
R2009 100R
C2011 270p
2mm DC connector
Pop-Port connector
Charge
Charge GND
Charge
Shielding GND
Charge GND
ACI
Vout
USB Vbus
Fbus_RX / USB D+
Fbus_Tx / USB D-
Data GND
XMICN
XMICP
XEARN
XEARP
XEARRN
XEARRP
Shielding GND

RETU, SIM, Audio

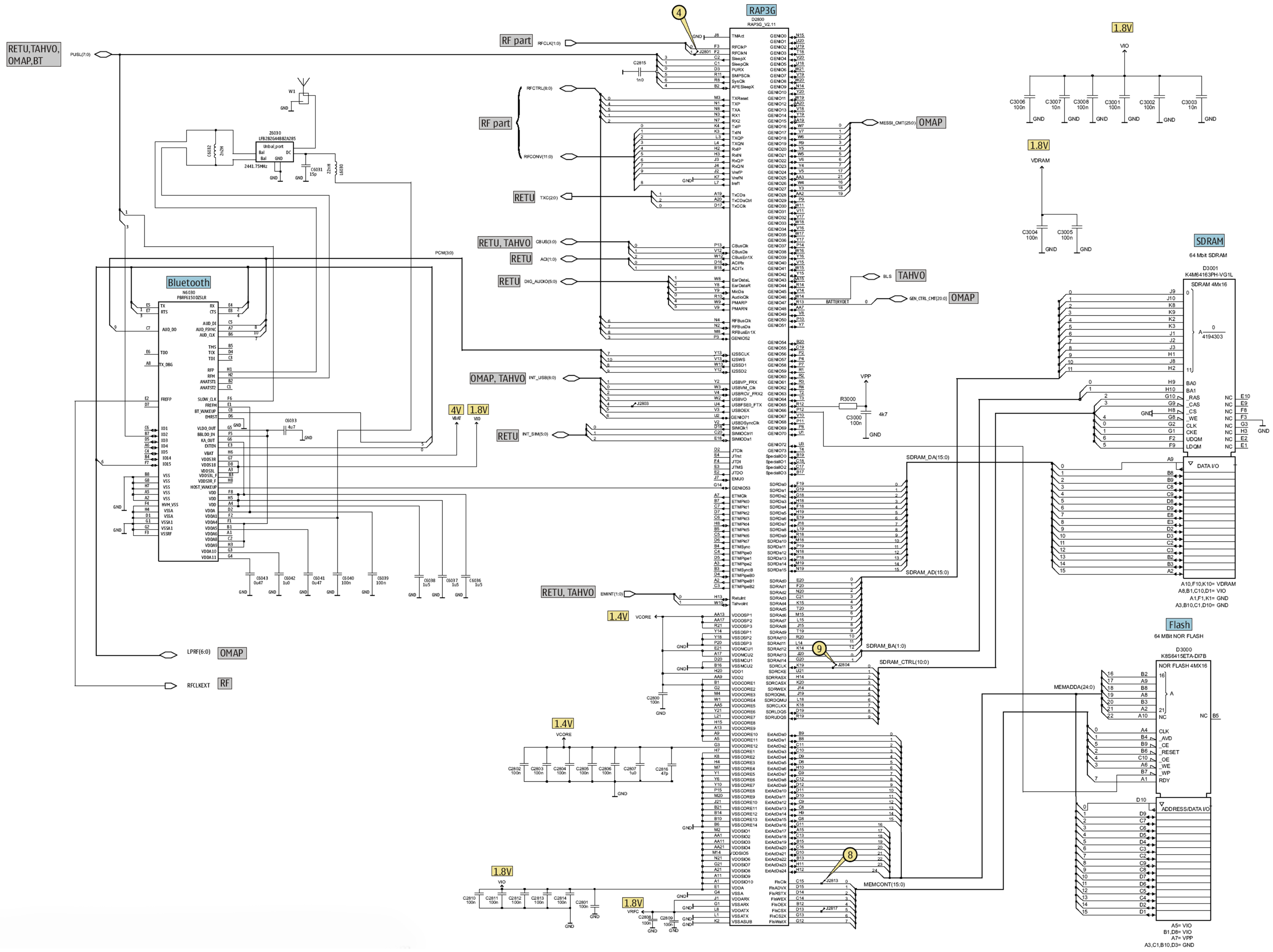

System connector
XAUDIO(7:0)
Microphone
R2100
EMIF01-SMIC01F2
B2100
MIC1P
MIC1N
MICB1
C2100
C2101
R2101
220R
C2102
4u7
X4400
EARP
R4400
R4401
C4402
C4403
L1471
L1472
220R/100MHz
C1479
C1480
C1481
HFSPP
HFSPN
IHF
X1470
H_BRIDGE(3:0)
RETU
N2200
RETU_3.02
Backup battery
G2200
3V3
C2233
27p
Battery connector
4V
VBAT
X2070
VBATT
BSI
BGND
J2070
J2071
J2072
1.35V
VREF_INT
2.5V
VANA
R2200
100k
R2201
120k
C2223
10n
C2224
10n
R2070
14V/50V
C2070
15p
BTEMP NTC
R2071
47k
C2202
1n0
C2234
27p
C2207
1n0
~4V if power switch unpessed
LS
LST
RFTEMP
VCHAR
WTXDET
VBAT3
C2203
C2204
C2205
C2206
1n0
Sleepclock oscillator
C2208
27p
32.768kHz
B2200
C2209
22p
R2203
3M3
TAHVO, RF part
X4400
RAP3G
SLOWAD(6:0)
DIG_AUDIO(5:0)
Z1470
EMIF02-MIC02F2
J1470
X1470
PWRONX
TAHVO, RAP3G
CBUS(3:0)
RAP3G
TXC(2:0)
INT_SIM(5:0)
J2200
J2201
J2202
J2204
J2205
J2206
J2207
J2209
J2210
J2211
J2212
J2213
J2214
J2215
L2202
220R/100MHz
L2204
600R/100MHz
L2203
600R/100MHz
L2206
600R/100MHz
L2205
220R/100MHz
C2225
C2226
C2227
C2230
C2228
C2232
1u0
C2231
10U
J2220
J2221
TAHVO
CHSWSTAT
RAP3G
ACI(1:0)
Mic2P
Mic2N
MicB2
XEarR
XEarRC
HookDet
XEarLC
XEarL
VDARx
VDATx
BSI
BTemp
HeadDet
LS
LST
RF Temp
VBat6
VChar
WTxDet
Crl
CrO
VBack
PwrOnX
SIMDetX
WDDis
AudClk
ChSws
EarDaL
EarDaR
MBusTx
PMARP
PMARN
SerClk
SerData
SerSelX
SleepX
TxCClk
TxCCtrl
TxCDa
HV
SIMClk1
SIMDa1
SIMIOC1
SIMClk2
SIMDa2
SIMIOC2
VBat1
VBat2
VBat3
VBat4
VBat5
VBatCP
VBatH
Mic1P
Mic1N
MicB1
EarP
EarN
Mic3P
Mic3N
Mic3PR
Mic3NR
MicBCap
VSARx
VSATx
MicSub
HFSpP
HFSpN
VibraP
VibraN
VBG
VRef
VAna
VAux
VDRAM
VIO
VR1
VRFC
VSIM1
VSIM2
VRCP1
VRCP2
VCP
FlyHigh
FlyLow
MBusRx
MicData
PURX
RetuInt
SlClk
MBus
RstX
AFC
TxC1
TxC2
SIMClkC1
SIMDaC1
SIMRstC1
SIMClkC2
SIMDaC2
SIMRstC2
TM
Gnd1
Gnd2
Gnd3
Gnd4
GndCP
GndH
C2200
1u0
C2201
C2210
C2211
4u7
C2220
C2221
C2222
C2212
C2213
C2214
C2215
C2219
C2216
C2217
RF active = 4.7V
1.8V
1.8V/3V
1.8V
2.5V
1.8V
1.8V
2.8V
2.5V
1.35V
VRCP2
VRCP1
VSIM2
VSIM1
VRFC
VR1
VIO
VDRAM
VAUX
VANA
VREF_INT
VREF
Depends on SIM = 1.8V/3V
VSIM1
J2208
EMINT(1:0)
RAP3G
USB_ACI(7:0)
System connector, TAHVO
TXC_CONV(2:0)
RF part
R211 47R
SIM Connector
X2700
C707_10M006_139_2
R2700
EMIF03-SIM01F2
C2700
100n
PURX = 1.8V
J2218
J2219
C2235
1n0
Local mode = 1.8V
PUSL(7:0)
RAP3G, OMAP, TAHVO, BT
GND
1
2
3
5
6
7
28
29
30

TAHVO

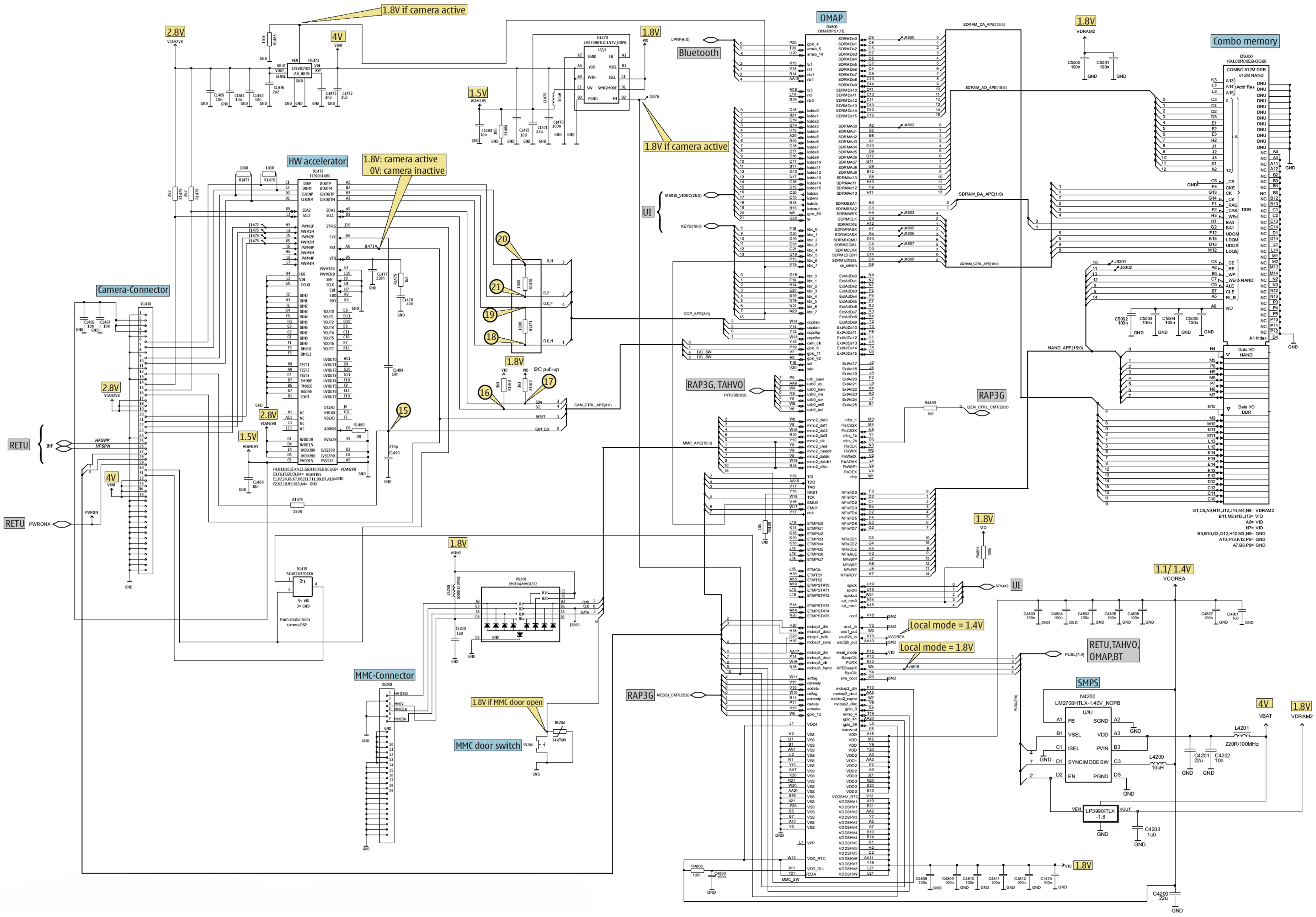

TAHVO
N2300
TAHVO_V4.1
4V
VBAT
L2301
220R/100MHz
C2309
22u
GND
1.4V
VCORE
C2300
10n
C2301
22u
L2302
10uH
C2302
22u
C2243
12p
4V
VBAT
System connector
CHARGER
C2306
1u0
SLOWAD(6:0)
CHSWSTAT
J2300
J2301
4V
VBAT
C2307
1u0
2.5V
VOUT
C2312
1u0
J2307
J2306
R2300
CURRENT_SEN
BGND
Current gauge sensor
5V
VBUS
C2313
1u0
VBAT1
VBAT1
VCoreCoil
VCoreCoil
VCore
GND1
GND1
VCharIn1
VCharIn2
VCharInK
VCharOut1
VCharOut2
VCharOutK
VChargADC
ChSwS
GND4
VBAT3
GND3
NC
Vout
GND5
SENSE+
SENSE-
VCC
Slave_PU
Master_PD1
Master_PD2
CLK
RXD2
D+_RXD
D-_TXD
VPP_VIO
VCCint
VIO
OEX
FSE0
VO
RCV_FRX2
VP_FRX
VM_CLK
FTX
SLAVESWSET
RSTX
PURX
SLEEPX
TahvoInt
CbusData
CbusSelX
CbusClk
VcoreDef
FlashM
TestMode
TestOut
GenOut1
GenOut2
GenOut3
PWM300
Clk600
SleepClk
SMPSClk
USB_ACI(7:0)
System connector, RETU
USB=3.5V
FBUS=2.5V
C2303
1u0
VIO
1.8V
C2304
10n
INTUSB(8:0)
OMAP
C2316
1n0
4V
PUSL(7:0)
RAP3G, RETU, OMAP, BT
EMINT(1:0)
RAP3G
CBUS(3:0)
RAP3G, RETU
J2302
J2305
J2308
13
11
Current control for keypad backlight from keyboard connector
SETCURR2
R2305
33R
Lights on = ~ 0.7V
Keypad
V2300
DTC143ZETL
IN
OUT
R1
4k7
R2
47k
4k7
R2301
10k
R2302
1.8V=BL on
12 =BL dimmed
0V=BL off
J2309
4V
VBAT
L2304
22uH
N2301
TK65600B-G
EN
VOUT
IND
VDD
FB
AGND
NC
PGND
C2315
4u7
C2314
4u7
14V=BL on
11.5V=BL dimmed
0V=BL off
VLEDOUT
R2303
1k0
R2304
39R
39k
R2307
SETCURR_K2
SETCURR_J
X4400
V2301
GenIO46
BLS
RAP3G
R2308
1k0
V2303

Backlight selection	logic level
Front display	0
Main display	1

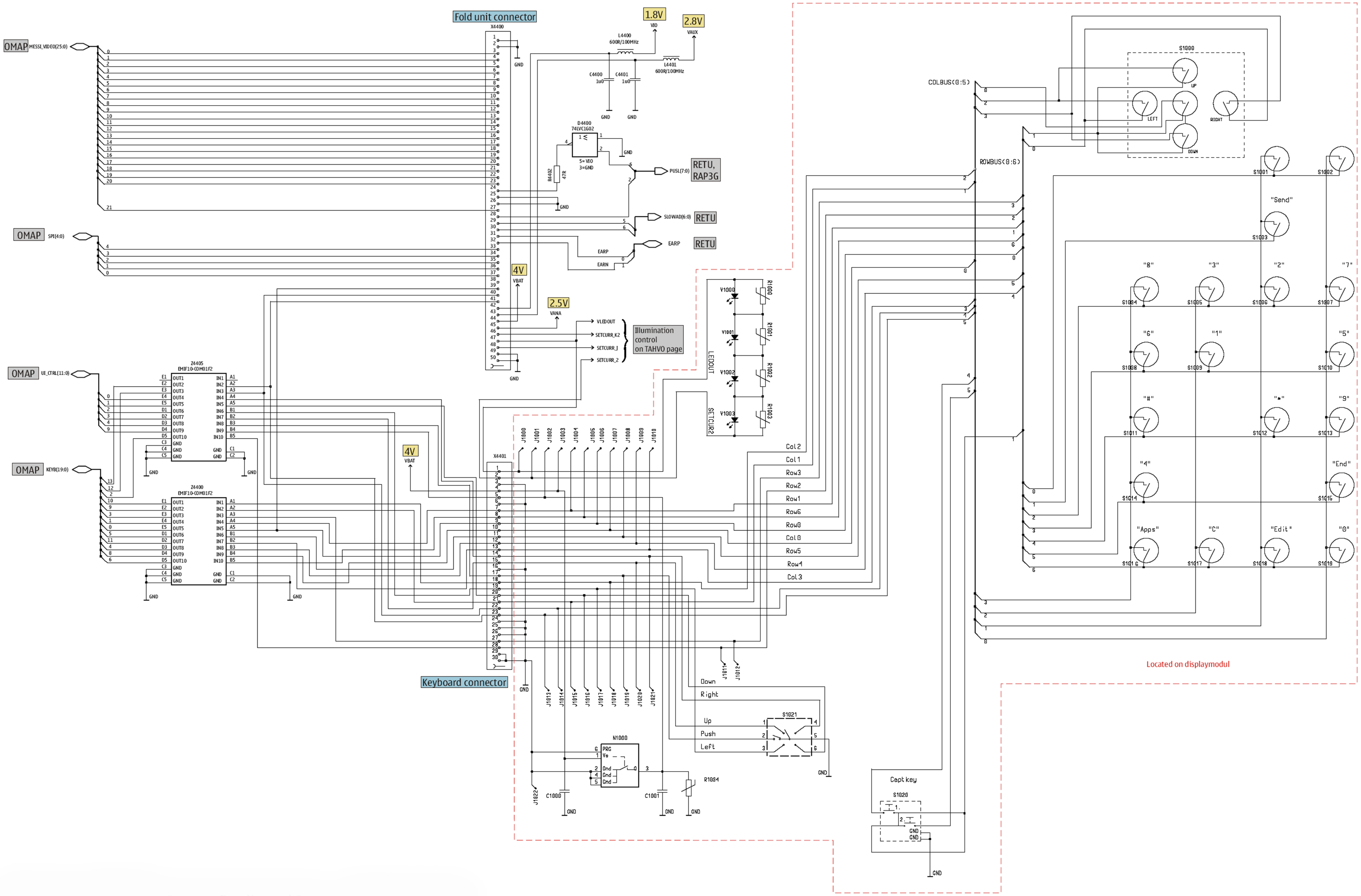
RAP3G, SDRAM, Flash, Bluetooth


RAP3G
D2800
RAP3G_V2.11
RETU,TAHVO,
OMAP,BT
PUSL(7:0)
RF part
RFCLK(1:0)
RFCTRL(8:0)
RFCONV(11:0)
RETU
TXC(2:0)
RETU, TAHVO
CBUS(3:0)
ACI(1:0)
DIG_AUDIO(5:0)
PCM(3:0)
OMAP, TAHVO
INT_USB(6:0)
INT_SIM(5:0)
RETU, TAHVO
EMINT(1:0)
OMAP
MESSI_CMT(25:0)
TAHVO
BLS
BATTERYDET
GEN_CTRL_CMT(20:0)
Bluetooth
N6030
PBRF6150D2S1R
Z6030
LFB2B2G44B2A285
2441.75MHz
W1
4V
1.8V
VBAT
VIO
1.4V
VCORE
VPP
R3000
4k7
C3000
100n
LPRF(6:0)
OMAP
RFCLKEXT
RF
1.8V
VIO
C3006 100n
C3007 10n
C3008 100n
C3001 100n
C3002 100n
C3003 10n
1.8V
VDRAM
C3004 100n
C3005 100n
SDRAM
64 Mbit SDRAM
D3001
K4M64163PH-VG1L
SDRAM 4Mx16
4194303
DATA I/O
A10,F10,K10= VDRAM
A8,B1,C10,D1= VIO
A1,F1,K1= GND
A3,B10,C1,D10= GND
SDRAM_DA(15:0)
SDRAM_AD(15:0)
SDRAM_BA(1:0)
SDRAM_CTRL(10:0)
Flash
64 MBit NOR FLASH
D3000
K8S6415ETA-DI7B
NOR FLASH 4MX16
MEMADDA(24:0)
MEMCONT(15:0)
ADDRESS/DATA I/O
A5= VIO
B1,D8= VIO
A7= VPP
A3,C1,B10,D3= GND
1.4V
VCORE
1.8V
VIO
1.8V
VRFC
4
8
9
GND

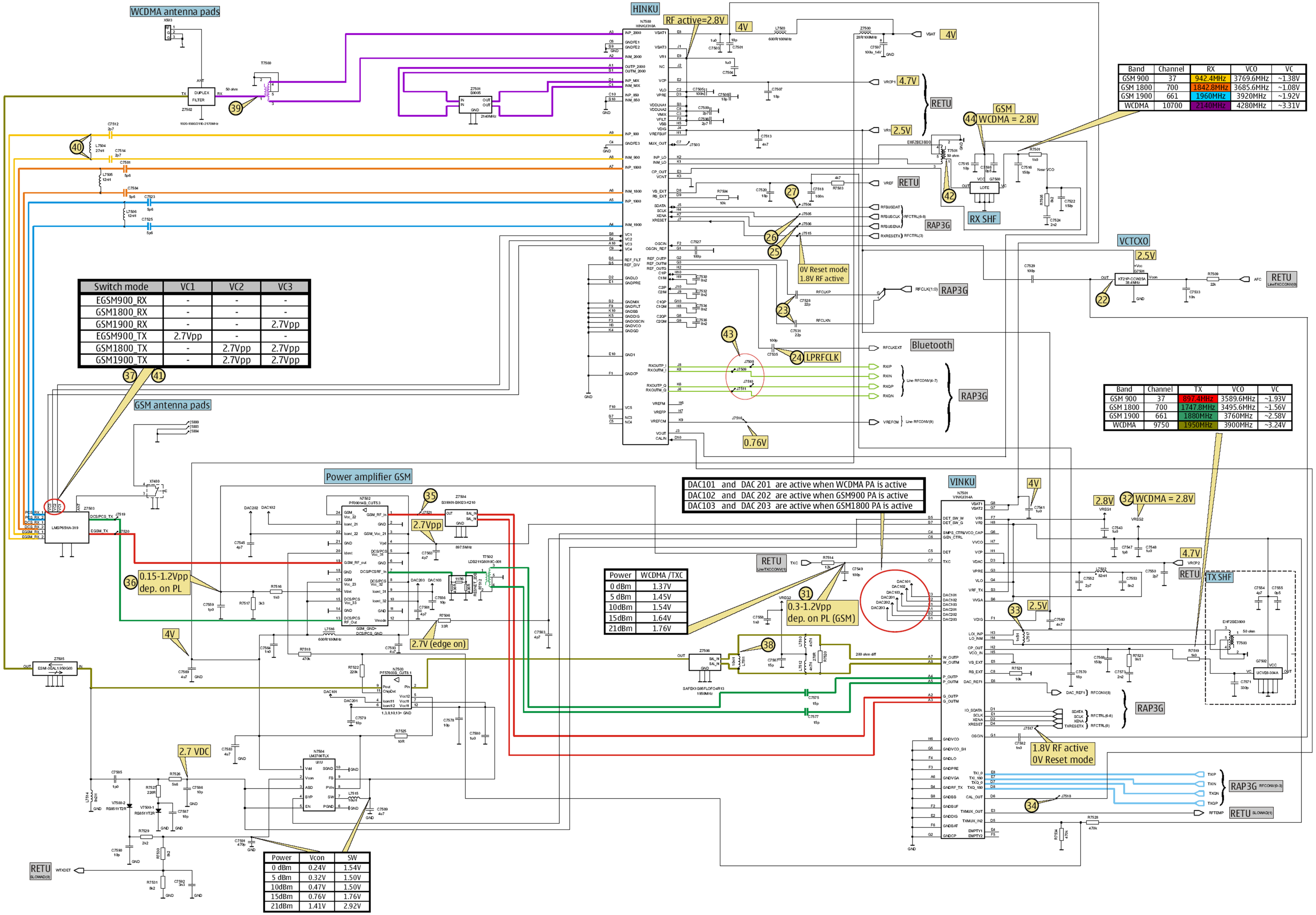
OMAP, Combo memory, Camera, MMC


1.8V if camera active
2.8V
4V
1.8V
1.5V
1.8V if camera active
HW accelerator
1.8V: camera active
0V: camera inactive
Camera-Connector
2.8V
RETU
4V
RETU
1.5V
2.8V
20
21
19
18
1.8V
I2C pull-up
16
17
15
OMAP
Bluetooth
UI
RAP3G, TAHVO
RAP3G
1.8V
Combo memory
1.8V
UI
1.1/ 1.4V
Local mode = 1.4V
Local mode = 1.8V
RETU,TAHVO,
OMAP,BT
SMPS
4V
1.8V
1.8V
MMC-Connector
1.8V if MMC door open
MMC door switch
RAP3G
1.8V

B to B Connections


Fold unit connector
X4400
1.8V
VIO
2.8V
VAUX
L4400
600R/100MHz
L4401
600R/100MHz
C4400
1u0
C4401
1u0
GND
D4400
74LVC1G02
5=VIO
3=GND
R4402
47R
OMAP
MESSI_VIDEO(25:0)
OMAP
SPI(4:0)
PUSL(7:0)
RETU,
RAP3G
SLOWAD(6:0)
RETU
EARP
EARN
EARP
RETU
4V
VBAT
2.5V
VANA
VLEDOUT
SETCURR_K2
SETCURR_J
SETCURR_2
Illumination
control
on TAHVO page
OMAP
UI_CTRL(11:0)
Z4405
EMIF10-COM01F2
OMAP
KEYB(19:0)
Z4400
EMIF10-COM01F2
4V
VBAT
X4401
Keyboard connector
V1000
V1001
V1002
V1003
R1000
R1001
R1002
R1003
LEDOUT
SETCUR2
J1000
J1001
J1002
J1003
J1004
J1005
J1006
J1007
J1008
J1009
J1010
J1011
J1012
J1013
J1014
J1015
J1016
J1017
J1018
J1019
J1020
J1021
J1022
Col2
Col1
Row3
Row2
Row1
Row6
Row0
Col0
Row5
Row4
Col3
Down
Right
Up
Push
Left
S1021
N1000
PRG
Vo
Gnd
C1000
C1001
R1004
Capt key
S1020
COLBUS(0:5)
ROWBUS(0:6)
S1000
UP
LEFT
RIGHT
DOWN
S1001
S1002
"Send"
S1003
"8"
"3"
"2"
"7"
S1004
S1005
S1006
S1007
"6"
"1"
"5"
S1008
S1009
S1010
"#"
"*"
"9"
S1011
S1012
S1013
"4"
"End"
S1014
S1015
"Apps"
"C"
"Edit"
"0"
S1016
S1017
S1018
S1019
Located on displaymodul

RF part


WCDMA antenna pads
HINKU
RF active=2.8V
4V
RETU
4.7V
2.5V
GSM
WCDMA = 2.8V
RX SHF
RAP3G
0V Reset mode
1.8V RF active
VCTCXO
2.5V
LPRFCLK
Bluetooth
0.76V
GSM antenna pads
Power amplifier GSM
2.7Vpp
0.15-1.2Vpp
dep. on PL
2.7V (edge on)
VINKU
2.8V
WCDMA = 2.8V
0.3-1.2Vpp
dep. on PL (GSM)
TX SHF
1.8V RF active
0V Reset mode
2.7 VDC
22
23
24
25
26
27
31
32
33
34
35
36
37
38
39
40
41
42
43
44

Switch mode	VC1	VC2	VC3
EGSM900_RX	-	-	-
EGSM1800_RX	-	-	-
EGSM1900_RX	-	-	2.7Vpp
EGSM900_TX	2.7Vpp	-	-
EGSM1800_TX	-	2.7Vpp	2.7Vpp
EGSM1900_TX	-	2.7Vpp	2.7Vpp

Band	Channel	RX	VCO	VC
GSM 900	37	942.4MHz	3769.6MHz	~1.38V
GSM 1800	700	1842.8MHz	3685.6MHz	~1.08V
GSM 1900	661	1960MHz	3920MHz	~1.92V
WCDMA	10700	2140MHz	4280MHz	~3.31V

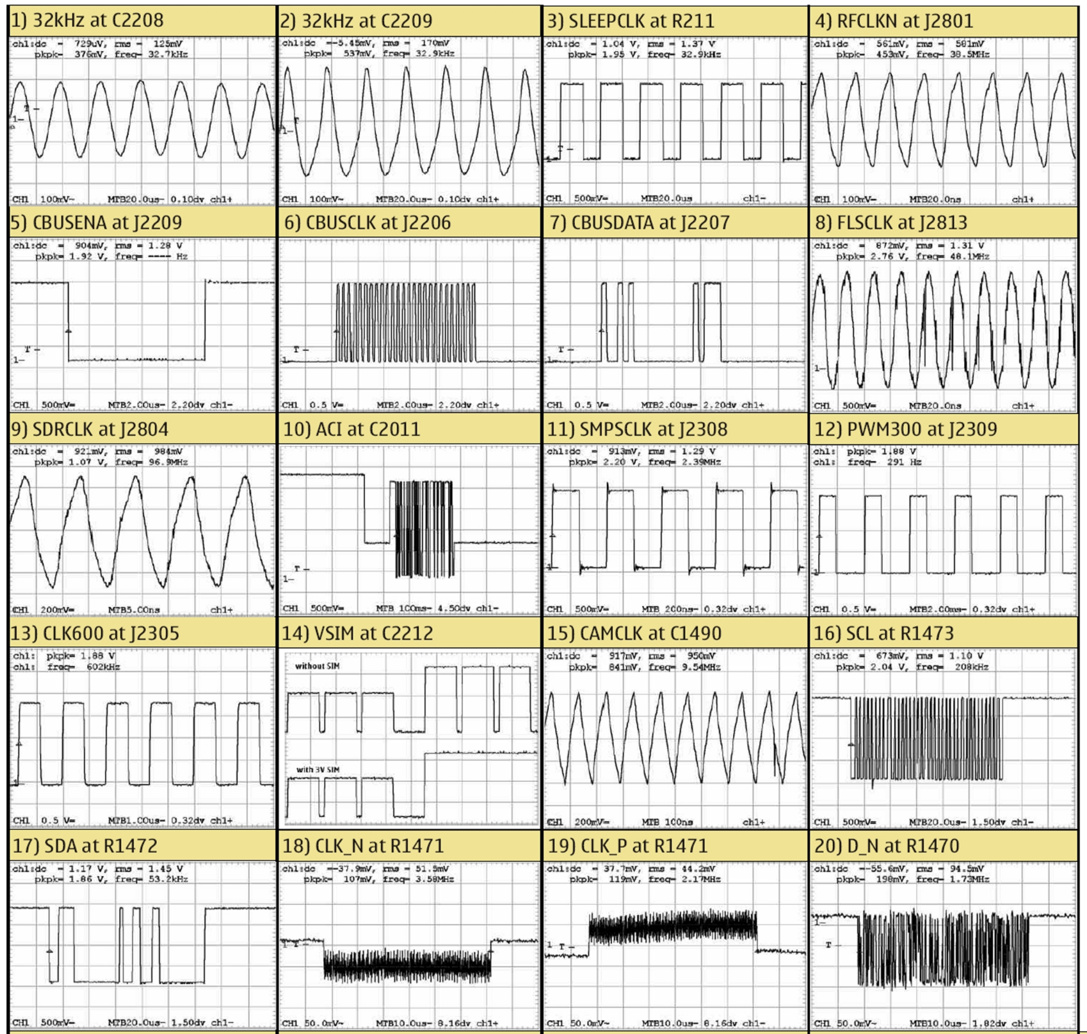
Band	Channel	TX	VCO	VC
GSM 900	37	897.4MHz	3589.6MHz	~1.93V
GSM 1800	700	1747.8MHz	3495.6MHz	~1.56V
GSM 1900	661	1880MHz	3760MHz	~2.58V
WCDMA	9750	1950MHz	3900MHz	~3.24V

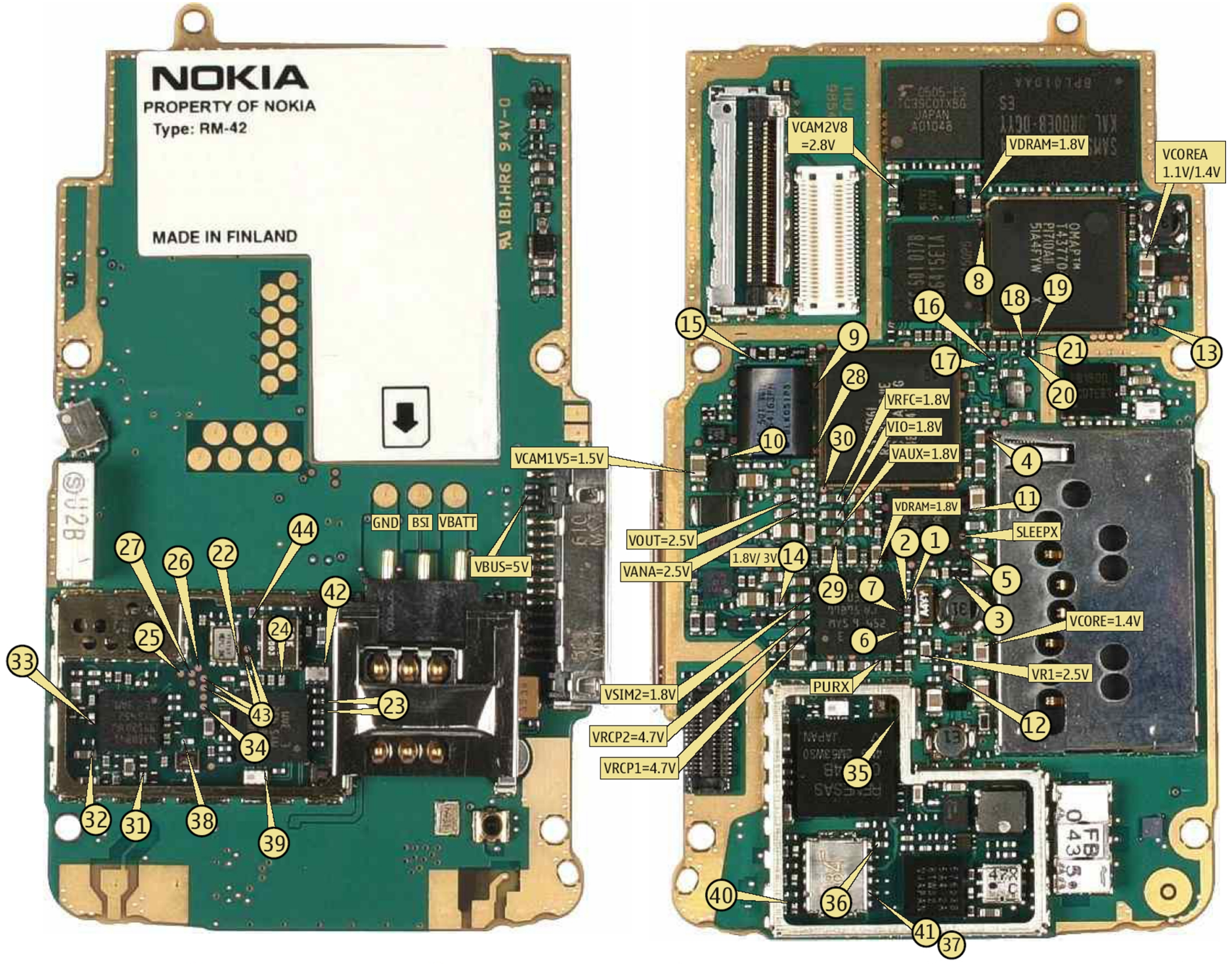
DAC101 and DAC 201 are active when WCDMA PA is active
DAC102 and DAC 202 are active when GSM900 PA is active
DAC103 and DAC 203 are active when GSM1800 PA is active

Power	WCDMA /TXC
0 dBm	1.37V
5 dBm	1.45V
10dBm	1.54V
15dBm	1.64V
21dBm	1.76V

Power	Vcon	SW
0 dBm	0.24V	1.54V
5 dBm	0.32V	1.50V
10dBm	0.47V	1.50V
15dBm	0.76V	1.76V
21dBm	1.41V	2.92V

Signal overview


1) 32kHz at C2208
2) 32kHz at C2209
3) SLEEPCLK at R211
4) RFCLKN at J2801
5) CBUSENA at J2209
6) CBUSCLK at J2206
7) CBUSDATA at J2207
8) FLSCLK at J2813
9) SDRCLK at J2804
10) ACI at C2011
11) SMPSCLK at J2308
12) PWM300 at J2309
13) CLK600 at J2305
14) VSIM at C2212
15) CAMCLK at C1490
16) SCL at R1473
17) SDA at R1472
18) CLK_N at R1471
19) CLK_P at R1471
20) D_N at R1470


NOKIA
PROPERTY OF NOKIA
Type: RM-42
MADE IN FINLAND
VCAM2V8 =2.8V
VDRAM=1.8V
VCOREA 1.1V/1.4V
VRFC=1.8V
VIO=1.8V
VAUX=1.8V
VCAM1V5=1.5V
VDRAM=1.8V
SLEEPX
GND
BSI
VBATT
VBUS=5V
VOUT=2.5V
VANA=2.5V
1.8V/3V
VCORE=1.4V
VR1=2.5V
PURX
VSIM2=1.8V
VRCP2=4.7V
VRCP1=4.7V
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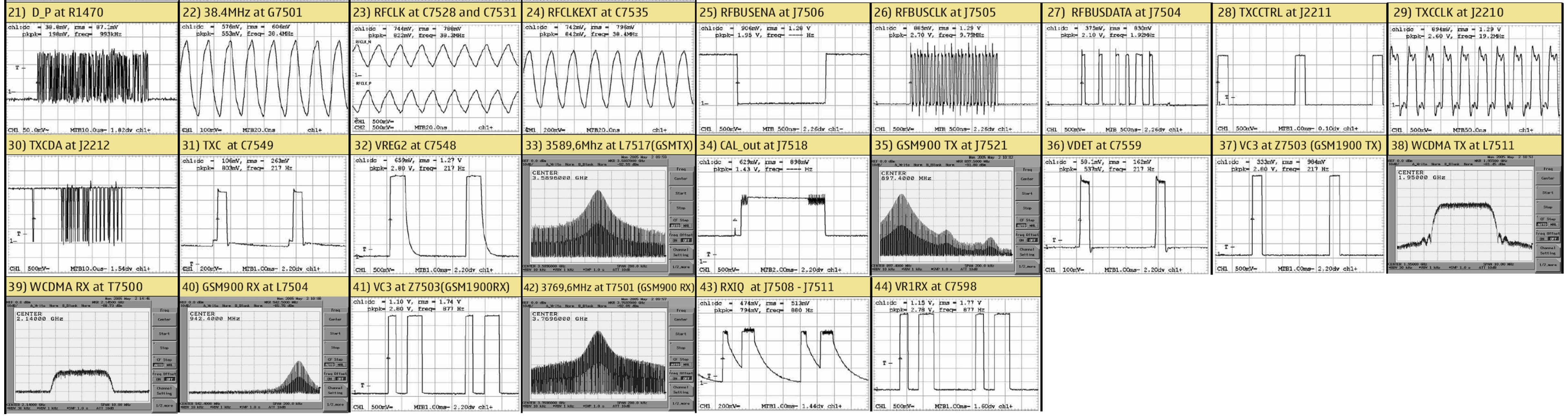
21) D_P at R1470
22) 38.4MHz at G7501
23) RFCLK at C7528 and C7531
24) RFCLKEXT at C7535
25) RFBUSENA at J7506
26) RFBUSCLK at J7505
27) RFBUSDATA at J7504
28) TXCCTRL at J2211
29) TXCCLK at J2210
30) TXCDA at J2212
31) TXC at C7549
32) VREG2 at C7548
33) 3589,6Mhz at L7517(GSMTX)
34) CAL_out at J7518
35) GSM900 TX at J7521
36) VDET at C7559
37) VC3 at Z7503 (GSM1900 TX)
38) WCDMA TX at L7511
39) WCDMA RX at T7500
40) GSM900 RX at L7504
41) VC3 at Z7503(GSM1900RX)
42) 3769,6MHz at T7501 (GSM900 RX)
43) RXIQ at J7508 - J7511
44) VR1RX at C7598

Component finder

B		C2227	J4	C4812	G6	C7558	N8	J2064	I6	J5004	P3	L7517	M9	R7501	K5
B2100	P9	C2228	J3	C4813	G6	C7559	O4	J2065	H6	J5100	F8	N		R7503	L8
B2200	K5	C2230	J4	C5000	D7	C7560	L8	J2066	I6	J5101	F9	N1470	I2	R7504	M7
C		C2231	L3	C5001	D7	C7561	N3	J2070	I3	J5102	F8	N1471	D5	R7505	K5
C1470	I1	C2232	J3	C5002	D8	C7562	N9	J2071	I3	J5103	F8	N2200	K4	R7506	N3
C1471	I2	C2233	M2	C5003	D7	C7563	N3	J2072	I4	J5104	F6	N2300	J5	R7509	K7
C1472	I1	C2234	J5	C5004	D8	C7564	O4	J2200	L4	J5105	F8	N2301	M6	R7512	M3
C1473	D6	C2235	L4	C5005	D8	C7567	M7	J2201	J5	J5106	F6	N4200	E9	R7514	N8
C1474	C1	C2300	J6	C5200	H7	C7568	M9	J2202	L3	J5107	G6	N4201	D6	R7516	O4
C1475	D4	C2301	J6	C6031	H9	C7569	N3	J2204	G5	J5108	F8	N6030	G8	R7517	O4
C1476	D4	C2302	L6	C6032	H8	C7570	L8	J2205	I4	J5109	F8	N7500	M6	R7518	N5
C1477	C5	C2303	I6	C6033	G9	C7571	L8	J2206	K5	J5110	F9	N7501	M8	R7519	M9
C1478	C6	C2304	J5	C6036	G8	C7573	M9	J2207	K5	J5200	G7	N7502	N4	R7520	M8
C1479	J1	C2306	I4	C6037	G9	C7575	M8	J2208	J4	J7503	N7	N7503	P5	R7521	N8
C1480	K1	C2307	I4	C6038	H7	C7576	P4	J2209	J6	J7504	L7	N7504	N5	R7522	O5
C1481	K1	C2309	I6	C6039	H8	C7577	M8	J2210	J3	J7505	L7	R		R7523	M9
C1482	D4	C2312	I3	C6040	G9	C7578	O5	J2211	H3	J7506	L8	R1470	G7	R7525	O5
C1483	D6	C2313	I3	C6041	H8	C7579	P6	J2212	I3	J7508	L7	R1471	F7	R7526	O6
C1484	B3	C2314	L6	C6042	H8	C7580	P6	J2213	I4	J7509	L7	R1472	G6	R7527	O6
C1485	B2	C2315	M5	C6043	G8	C7581	P3	J2214	J3	J7510	L6	R1473	G6	R7528	M9
C1486	C4	C2700	M4	C7501	M7	C7582	L9	J2215	K3	J7511	L6	R1474	G2	R7529	O5
C1487	C2	C2800	I3	C7503	M7	C7583	N5	J2218	E9	J7515	G5	R1475	C6	R7530	O5
C1488	C1	C2801	H6	C7504	M7	C7584	O3	J2219	J6	J7516	M7	R1476	C5	R7531	O5
C1489	G2	C2802	H6	C7505	L6	C7585	O6	J2220	I4	J7517	L7	R1477	C5	R7534	N5
C1490	G2	C2803	I3	C7507	M5	C7586	O6	J2221	I4	J7518	M7	R1478	C1	S	
C2000	D1	C2804	I3	C7508	L5	C7587	O6	J2300	J4	J7519	O4	R1479	C1	S5200	H9
C2001	D1	C2805	I3	C7509	M5	C7588	N5	J2301	I6	J7520	O4	R1480	G2	T	
C2002	K2	C2806	G6	C7512	P3	C7589	N5	J2302	I5	J7521	M5	R1483	D6	T7500	N6
C2003	K2	C2807	H6	C7513	L6	C7590	O5	J2305	E9	U1	G6	R1484	I2	T7501	L5
C2004	K2	C2808	H6	C7514	P3	C7591	O5	J2308	I6	L		R2000	K2	T7502	M3
C2005	J2	C2809	H6	C7515	K6	C7592	O5	J2309	L5	L1470	I1	R2001	J2	T7503	K9
C2006	J2	C2810	I3	C7516	K6	C7593	M3	J2801	H6	L1471	K1	R2002	K2	V	
C2007	L2	C2811	G3	C7518	N7	C7595	M4	J2802	G3	L1472	K1	R2003	K2	V2000	E1
C2008	L2	C2812	I3	C7520	N7	C7596	N6	J2803	G6	L2000	E1	R2004	L2	V2300	L6
C2009	K2	C2813	I2	C7522	K5	C7597	M2	J2804	G3	L2001	K2	R2005	L2	V2301	K2
C2010	K2	C2814	I4	C7523	O3	C7598	K6	J2813	E6	L2002	K2	R2006	K2	V2303	K2
C2011	H2	C2815	I6	C7524	L5	D		J2817	I4	L2003	L2	R2007	H1	V7500	O6
C2070	L3	C2816	H6	C7525	O3	D1470	B1	J3100	I5	L2202	L3	R2008	H1	W	
C2100	L5	C3000	F5	C7526	K7	D1471	B5	J3101	I6	L2203	J4	R2009	H1	W1	J9
C2101	L5	C3001	F5	C7527	M5	D2800	H4	J3102	I5	L2204	J4	R2070	K2	X	
C2102	L6	C3002	F5	C7528	M5	D3000	E5	J3103	I5	L2205	J3	R2071	K5	X1470	D2
C2200	L4	C3003	F5	C7529	L6	D3001	H2	J3104	I5	L2206	J3	R2100	O9	X2000	H1
C2201	J5	C3004	G2	C7530	L7	D4400	G3	J3105	I5	L2301	J6	R2101	L5	X2001	K1
C2202	L5	C3005	H2	C7531	M5	D4800	E7	J3106	H6	L2302	K6	R211	J5	X2061	O3
C2203	K5	C3006	H2	C7532	L6	D5000	C7	J3107	E6	L2304	M5	R2200	L5	X2070	K3
C2204	L4	C3007	I2	C7533	K7	F		J3108	F6	L2305	M6	R2201	I4	X2700	M4
C2205	L5	C3008	I2	C7534	L7	F2000	F1	J3109	F6	L4200	D9	R2203	K5	X4400	E3
C2206	L5	C4200	E9	C7535	L6	G		J3110	H5	L4201	F9	R2301	J6	X4401	M1
C2207	J4	C4201	F9	C7536	M7	G2200	N2	J3112	G6	L4400	D1	R2302	M6	X5200	K8
C2208	K5	C4202	F9	C7537	P4	G7500	L6	J3113	G6	L4401	C1	R2303	L1	X7400	O2
C2209	K5	C4203	D6	C7538	O4	G7501	L7	J3114	F6	L5200	G6	R2304	L1	Z	
C2210	J3	C4400	D1	C7539	P4	G7502	K8	J3115	G5	L6030	G9	R2305	L2	Z1470	J2
C2211	J3	C4401	C1	C7540	N9	J		J3116	G5	L7400	P2	R2307	K2	Z2000	I2
C2212	K3	C4402	L2	C7541	N9	J1470	J2	J3117	G5	L7502	L9	R2308	K3	Z2001	I2
C2213	I3	C4403	L3	C7542	N9	J1471	C4	J3118	G5	L7503	N9	R2700	M4	Z2003	I2
C2214	L5	C4800	D9	C7543	N8	J1472	C4	J4800	B6	L7504	P3	R3000	F4	Z4400	K1
C2215	I3	C4801	G6	C7544	M5	J1473	C4	J4802	B6	L7505	P3	R4400	L2	Z4405	J1
C2216	J3	C4802	G7	C7545	N5	J1474	C4	J4803	B7	L7506	O3	R4401	L3	Z6030	H9
C2217	I3	C4803	D9	C7547	N9	J1475	C4	J4805	B7	L7510	M8	R4402	G3	Z7500	M3
C2219	J4	C4804	G6	C7548	N9	J1476	G2	J4806	D6	L7511	M7	R4800	D9	Z7501	N5
C2220	K3	C4805	D6	C7549	N8	J2001	I3	J4807	D7	L7512	M8	R4801	F9	Z7502	O8
C2221	K3	C4806	E9	C7550	L9	J2002	H1	J4808	B7	L7513	N7	R4809	F6	Z7503	O3
C2222	K3	C4807	F9	C7552	L9	J2003	H2	J4818	H6	L7514	P6	R5100	F9	Z7504	M4
C2223	L4	C4808	F5	C7553	L9	J2060	I7	J5000	P2	L7515	N6	R5200	G7	Z7505	P6
C2224	L5	C4809	G6	C7554	K8	J2061	H7	J5001	B8	L7516	M3	R5204	E10	Z7506	N7
C2225	K3	C4810	G6	C7555	K8	J2062	I7	J5002	B8						
C2226	J2	C4811	F9	C7556	N3	J2063	H7	J5003	P2